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DISEASES DUE TO PROTOZOAN PARASITES.

PAN-AFRICAN VETERINARY CONGRESS. **Specific Animal Diseases. Trypanosomiasis Tsetse Bionomics.**—*The Farmers' Journal.* Nairobi. 1923. May 10, 17 & 24. Vol. 5. Nos. 19, 20 & 21. pp. 24–30; 28–29; & 9.

RICHARDSON (Uganda) emphasizes the difficulties of dealing with trypanosomiasis partly owing to lack of knowledge and in part on account of shortage of staff for field work. No accurate figure can be given for the annual losses among cattle, but it is probably not less than 10,000 head.

Three morphologically distinct trypanosomes are recognizable in Uganda: *T. brucei*, *T. congolense* and *T. vivax* (with a subgroup, *T. uniforme*).

T. brucei is non-pathogenic to cattle. *T. vivax* causes loss of condition and reduction of milk, and has been held to be responsible for heavy losses by death in the field, but in no case has it been responsible for death in animals kept under observation at the laboratory at Entebbe. *T. congolense* usually proves fatal, the disease running its course in about two months.

Losses are caused in Uganda in two ways. The first is extension of the tsetse areas, and the second the spread of the disease into areas believed to be tsetse-free. The latter is the more important. While there are probably undetected tsetse areas, outbreaks have been detected in places where tsetse have not been discovered. Outbreaks in such areas are usually observed after extension of a fly belt and the consequent movement of cattle. In these cases Tabanidae and Stomoxys have been held responsible, but the former are often so scanty as to make it highly improbable that they are concerned to any large extent. On the other hand, infected cattle have been taken into stations where Stomoxys is very prevalent without starting an outbreak.

The difficulty of diagnosis complicates the problem. *T. vivax* and *T. congolense* can, as a rule, be discovered, but cases have occurred in which daily examinations have failed to reveal *T. congolense* up to two months and *T. vivax* up to three months.

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Treatment has been adopted in some cases with success. Intravenous injections of tartar emetic have given the best results, but relapses or reinfections make this method of control of little value. In any case the course of treatment is too long to be of practical value on a large scale.

Glossina palpalis readily conveys *T. vivax* and *uniforme*, but does not appear to play an important part in the transmission of *T. congolense.*

HORNBY agreed with RICHARDSON that infected cattle might be taken into a Stomoxys area without causing an outbreak. He agreed that Stomoxys, as a blood-sucking fly, might act as a mechanical transmitter of trypanosomiasis, but was of the opinion that Tabanus, Haematopota and Pangonia were more important. The disease is rarely maintained indefinitely by mechanical transmission only.

With regard to *T. brucei*, HORNBY agreed that it is not pathogenic for cattle, but pointed out that cattle may act as a reservoir. This is a factor in the problem of trypanosomiasis in man. Emphasis was laid upon the necessity of investigating the alleged immunity to trypanosomiasis among certain local races of cattle throughout Africa.

MCCALL (Tanganyika) described the distribution of the tsetse areas:—

1. *The Coastal Zone.*—This zone is most important. Although this area comprises one-fifth of the entire country, it is estimated that it contains only some 20,000 head of cattle which are localized in fly-free areas.

2. *Western Zone.*—This zone is some 900 miles in length, and measures 390 miles at its widest part. It is not a solid block of tsetse country, but contains numerous fly areas. It runs from north to south, and is separated from the coastal zone by the highlands of the interior.

Apart from these two large areas there are other fly belts scattered throughout the territory. Inaccurate knowledge regarding the extent and existence of fly belts makes any opinion as to the expansion or contraction of these impossible in most cases. There are, however, areas in which definite expansion is known to be proceeding.

MCCALL thinks that the solution of the tsetse problem lies in the future expansion of population with their flocks and herds, with the associated clearing of land.

G. morsitans is the common fly of the country, although other species are encountered. *G. pallidipes* comes second in order of frequency and *G. brevipalpis* third. *G. longipennis*, *G. fusca*, *G. austeni* and *G. swynnertoni* are also known to occur.

Mechanical transmission by Stomoxys and Tabanidae is not the common method.

Subsequently there was some discussion which does not lend itself to abstraction.

YAKIMOFF (W. L.). **Au sujet de la trypanosomiase des chameaux russes.** [Trypanosomiasis of Russian Camels.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 314–319.

Although this paper is a résumé of the author's previous publications regarding trypanosomiasis of camels in Russia, and includes the work done by SCHOUKEWITSCH, OURANOFF, PETROWSKY, and MIROTWORSKY, it is perhaps convenient to abstract it.

Trypanosomiasis in Russian camels was first detected by FEINSCHMIDT in 1912 in Astrakhan, and since that date the geographical distribution of the disease has been gradually mapped out. It has

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most recently been discovered in Saratov. The causal parasite is of the nagana type, and from the measurements given by Yakimoff would appear to be monomorphic.

LAVERAN & MESNIL, on the grounds of cross immunity tests, have expressed the opinion that the parasite is not identical with *T. brucei*, *T. equiperdum*, *T. evansi*, or *T. soudanense*.

Clinically the disease is a chronic one, and may last up to two years. Weakness, discharge from the eyes (in some cases) and progressive enlargement of the lymphatic glands are the most obvious symptoms. In some cases elevations of temperature of brief duration are the only evidence of infection. The presence of trypanosomes in the blood is very irregular. The parasite is inoculable to a number of animals. In rats, mice and dogs the infection produced is acute ; in horses, rabbits and guinea-pigs subacute, and in ruminants chronic, and terminates in recovery.

Nothing definite is known regarding the reservoir of the virus, but Yakimoff disagrees with OURANOFF, who believes that the parasite maintains itself in cattle, and incriminates the camel. The manner in which the transmission is effected under natural conditions is also not known.

Tartar emetic and salvarsan are said by Yakimoff and WASSILEWSKY to be of value in the treatment of the disease. Trypanblue and dianyl-blue have not yielded favourable results. MIROTWORSKY, on the other hand, has found salvarsan and atoxyl useless.

YAKIMOFF (W. L.). **Au sujet du** *Trypanosoma ninae kohl-yakimov*. —*Bull. Soc. Path. Exot.* 1923. Apr. 11. Vol. 16. No. 4. pp. 249–252.

In this paper the author reviews some of the literature regarding the clinical symptoms of camels affected with surra and debab, and distinguishes these from the symptoms presented by camels affected with trypanosomiasis in Turkestan.

The differences between the infections are expressed in tabular form as follows :—

	Russian Trypanosome.	*T. evansi.*	*T. soudanense.*
Camel ..	Oedema	Oedema	No oedema
Horse ..	No oedema	Oedema	Little or none
Cattle ..	Mortality not known	25–30% fatal	?
Sheep ..	Fatal	Sometimes fatal	Fatal
Goats ..	Fatal	Recovery	Frequently recovery
Pigs ..	Fatal	?	?
Dogs ..	Oedema	Eye lesions	No oedema Eye lesions
Rabbits ..	No oedema	No oedema	Oedema

On these grounds he considers that *T. ninae kohl-yakimov* stands as a species.

HOARE (C. A.). **On a Trypanosome occurring in British Sheep, and its Transmission by the Sheep Ked.**— *Vet. Jl.* 1923. Aug. Vol. 79. No. 8. pp. 271–274. With 1 text fig.

A fuller account of this parasite and its transmission has appeared elsewhere and has already been dealt with. [See this *Bulletin*, 1922, Nov., Vol. 10, No. 4, pp. 107–108.]

IWANOW (E.). **Experiments in the Disinfection of Sperm in Mammals, especially in relation to Dourine in Horses.**—*Parasitology.* 1923. June. Vol. 15. No. 2. pp. 122–127.

The author has carried out experiments in which the effects of radium and ultra-violet rays upon the semen of mammals were tested. The records of these tests have probably been destroyed, but Iwanow states that both these agencies gave bad results. Radium, although not causing loss of motility in the spermatozoa, destroyed their fertilizing power. Ultra-violet rays left spermatozoa still potent provided a large amount of semen was used, and the rays did not penetrate the whole layer of the liquid. Under such conditions any infective agent in the semen would also survive.

Experiments with chemical agents :—

Alcohol was found to be more destructive to spermatozoa than *T. equiperdum*. Semen containing 10 per cent. alcohol was found to be active in fertilization. In 20–25 per cent. alcohol some trypanosomes could be found which were still motile after 80 minutes' exposure. Spermatozoa cease movement immediately in 20 per cent. alcohol.

Atoxyl.—*T. equiperdum* remains infective in the presence of 8–10 per cent. atoxyl. A combination of 5 per cent. atoxyl in saline and 5 per cent. alcohol slightly weakens but does not destroy the infective power of the trypanosome.

Salvarsan (Arsol, Arsaminol) and *Neosalvarsan.*—Dilutions of 1 : 10,000 of these drugs in saline fail to kill trypanosomes after 15 minutes but deprived them of their infectivity, probably owing to inhibition of multiplication. Neosalvarsan gave similar results in five minutes. The results were the same with Arsaminol in 1 : 20,000. Arsol when added to dog's semen in concentrations up to 1 : 1,000 does not appear to affect the motility after 30 minutes. More prolonged exposure has an increasing effect upon the motility.

With spermatozoa of the horse, Arsol in 1 : 10,000 appears to be almost without effect up to two hours' exposure.

Protocols of some experiments are given in which *T. equiperdum* was acted upon by Arsol, Neosalvarsan, and Arsaminol before inoculation. Arsol in 1 : 10,000 for 15 minutes rendered *T. equiperdum* incapable of infecting mice.

The same result was obtained with neosalvarsan in the same dilution.

Arsaminol in dilutions of 1 : 25,000, 1 : 50,000, and 1 : 100,000, with 30 minutes' exposure, failed to render *T. equiperdum* non-infective for mice.

T. equiperdum subjected to 1 : 20,000 of Arsol for 30 minutes was found to be incapable of infecting three rabbits.

The author points out that it may be possible to apply these results to the control of dourine.

RUPPERT (F.). **Die prophylaktische Anwendung von "Bayer 205" bei Trypanosomeninfektion groszer Haustiere.** ["Bayer 205" as a Prophylactic against Trypanosomiasis in the Larger Domesticated Animals.]—*Berlin. Tierärzt. Woch.* 1923. Aug. 9. Vol. 39. No. 32. pp. 369–370.

The author puts on record a small number of experiments in which rabbits were injected with the drug prior to being inoculated with trypanosomes, and others in which rabbits which had been cured of

dourine were reinoculated with other trypanosomes. It was found that in doses of 0·4 gm. per kilog. the drug protected the rabbits against inoculation with *T. equiperdum*, *T. equinum* and *T. brucei* for periods up to six months, but that death from trypanosomiasis occurred when the period elapsing between the injection of the drug and inoculation was longer.

In countries where trypanosomiasis occurs, drugs which are capable of curing infection but which leave the animal open to reinfection are of no value. What is required is some method by which more or less durable resistance to the infection can be established.

With a view to testing the toxicity of "205" eleven horses were injected with doses ranging from 1·5 to 0·25 (gm.) per hundredweight (pro Zentner). From these experiments it was found that the maximum tolerated dose was 0·75, but that this produced symptoms in two out of three animals. It is noted that these symptoms resembled those of chronic trypanosomiasis, swelling of the legs, head and genitals, facial paralysis, and plaques. In view of these results eight horses (healthy) were injected with doses ranging from 0·25 to 0·75 gm. (pro Zentner), and after varying intervals were inoculated with trypanosomes.

A dose of 0·5 gm. was found to be effective for protection when the infective inoculation was given after an interval of a month.

The next question to which an answer was sought was whether the dose which prevented infection up to one month—that is to say, a period amounting to twice the incubation period of the inoculated infection—would be effective for the cure of existing disease. Details of five horses treated are given, and from these it appears that 0·5 gm. pro Zentner is sufficient to effect a cure.

As it was thought possible that a real cure had not been effected and that trypanosomes had been cleared from the circulation only, one of the cured animals was killed and its bone marrow used for the inoculation of guinea-pigs. None of the latter became infected.

The author thinks that the bad results reported by some other authors must have been due to incorrect dosage. He thinks it unlikely that a drug which in the case of mouse experiments has a chemotherapeutic index of 1 : 400 should in the case of chronic mal de caderas have an index of 1 : 2, as has been reported.

VAN SACEGHEM (René). **Action des composés de bismuth sur la trypanosomiase.** [The Action of Certain Bismuth Compounds in Trypanosomiasis.]—*Bull. Agric. Congo Belge.* 1923. June–Sept. Vol. 14. Nos. 2–3. pp. 394–396.

The drugs used were bismuth hydroxide and tartro-bismuthate of potassium and sodium. The former was injected intramuscularly in suspension in olive oil (1 gramme in 2 cc.).

Two cattle infected with *T. congolense-pecorum* var. *ruandae* were given 10 cc. The injection was without effect in either animal.

An intravenous injection of 5 grammes of the sodium-potassium salt in 50 cc. of distilled water caused death within a few minutes. In the second case the drug was administered progressively. The first dose was ·5 g. in 10 cc. This was followed by 1 g. and 1·5 g. These did not cause disappearance of the trypanosomes from the circulation. Two grammes produced a fatal result within a few minutes.

The same drug was then tried suspended in oil as an intramuscular injection (1 gramme in 2 cc.), and in a second case the suspension was

administered subcutaneously. These injections were without effect upon the trypanosomes, but the subcutaneous injection caused a local inflammatory reaction, which subsequently subsided.

VAN SACEGHEM (R.). **Les trypanosomes pathogènes dans le liquide cephalo-rachidien.** [Pathogenic Trypanosomes in the Cerebro-Spinal Fluid.]—*Bull. Agric. Congo Belge.* 1923. Mar. Vol. 14. No. 1. pp. 58–59.

Van Saceghem has examined liquid obtained by lumbar puncture from cattle in all stages of infection with *T. congolense-pecorum* and has failed to detect them. Moreover, such liquid has not produced infection in guinea-pigs inoculated with it.

The paralysis and other symptoms of nerve disorder seen in this trypanosomiasis are apparently due to toxins, since there are no discoverable lesions in the central nervous system. The paralysis is an important point in connexion with the spread of the disease. *T. congolense-pecorum* is spread by blood-sucking flies mechanically, and the paralysis leaves the animals without defence against the attacks of the flies. The latter are therefore able to acquire a heavy infection.

VAN SACEGHEM (R.). **Le pouvoir attachant du "*Trypanosoma congolense-pecorum*" variété "*ruandae*" pour les hématies.** [The Power of *T. congolense-pecorum* var. *ruandae* for attaching itself to Corpuscles.]—*Bull. Agric. Congo Belge.* 1923. Mar. Vol. 14. No. 1. pp. 49–50.

In fresh specimens of blood containing the trypanosome the parasites are found for the most part to be attached to corpuscles by their anterior end. If a few cubic centimetres of such blood (defibrinated) are placed in a tube of simplified Novy medium and a specimen is examined after 24 hours, it is found that the parasites are not attached to the corpuscles.

The author thinks that the parasites have lost their power of fixing themselves on to the corpuscles, since they show evidence of degeneration.

The author revives the suggestion that *T. congolense-pecorum*, which is not an active trypanosome in the sense of changing its location, attaches itself to corpuscles for the purpose of being carried along in the blood-stream and so distributed throughout the body.

FRANCHINI (G.). **Action des latex végétaux sur différents protozoaires. Culture de trypanosomes dans les latex. (2e Note.)** [The Effect of Vegetable Latex upon Certain Protozoa. The Cultivation of Trypanosomes in Latex.]—*Bull. Soc. Path. Exot.* 1923. Apr. 11. Vol. 16. No. 4. pp. 256–263.

The author records the results obtained in further experiments in connexion with the action of latex upon protozoa and the cultivation of trypanosomes in the liquid.

The trypanosomes used in the experiments were: *T. equinum*, *T. pecaudi*, *T. marocanum*, *T. rhodesiense*, *T. cruzi* and *T. lewisi*. In addition to these the following protozoa have been used: *Crithidia melophagi*, *Crithidia gerridis*, the amoebae of dysentery, *Lamblia* (*Giardia*) *hominis* and *muris*, *Trichomonas* and *Cercomonas hominis*, Trichomonas, Hexamitus and Tetramitus of the mouse.

The plants providing the latex were: *Euphorbia mamillaris, Eu. drupifera, Eu. nereifolia, Eu. biglandulosa, Eu. calyculata, Eu. laro, Eu. grandidens, Asclepias curassavica, Gomphocarpus fruticosus, Hoja-fraterna, Alstonia scholaris, Strophanthus hispidus, S. rigali-cornu, Plumeria alba, Tanghina venenifera, Funtumia elastica, Lacoocha artocarpus,* and *Ficus glabella.*

The technique employed was the same as that used in the experiments already reported [see this *Bulletin*, 1923, May, Vol. 11, No. 2, p. 53].

In view of the number of protozoa and plants used it is impossible to abstract briefly the results obtained with the different combinations. Further, it is difficult to gather from the details supplied what were the exact results obtained, for the reason that in many cases particulars of only one observation of the cultures are given. It appears to be a general rule, however, that the trypanosomes do not retain their motility for more than 48 hours. In some cases the organisms appeared to perish without undergoing any alteration in morphology, while in others trypanosomes became leishmaniform. *T. cruzi*, however, in the latex of *Plumeria alba* and *Euphorbia calyculata* showed some multiplication after incubation for a fortnight at 26° C., and parasites were still more numerous after a month.

T. lewisi is more difficult to cultivate in latex than *T. cruzi*. Other trypanosomes did not yield cultures. The Crithidia appeared to retain their vitality in latex longer than trypanosomes.

Amoebae, Lamblia, and intestinal protozoa retain their vitality for variable periods.

The extraordinary rapidity of growth of some of the intestinal bacteria in latex leads the author to suggest the possibility of its use as a culture medium.

LAVERAN (A.) & FRANCHINI (G.). **Expériences sur les flagellés de la punaise du chou.** [Experiments with Flagellates from the Cabbage Bug.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 319–323. With 2 text figs.

The authors find that in the intestine of the red cabbage bug (*Pentatoma ornatum*) there may be found flagellates belonging to the genera *Herpetomonas* and *Crithidia*, which are capable of producing slight infections in young white mice inoculated intra-peritoneally. On a single occasion cultures from the blood of an infected mouse on N.N.N. medium yielded small round and oval organisms. These did not develop into flagellates.

VELU (H.) **Les Piroplasmoses du bétail marocain.** [Bovine Piroplasmoses in Morocco.]—*Rec. Méd. Vét.* 1923. Apr. 30. Vol. 99. No. 8. pp. 158–159.

During the year 1922 *Piroplasma bigeminum, Anaplasma marginale,* and *Piroplasma bovis* have been detected among imported animals during the summer months.

Investigation of the parasites found in indigenous animals has led the author to the following conclusions:—

1. A form of bovine theileriasis exists which appears to be the common piroplasmosis of indigenous cattle.

2. This disease is transmissible in series by subcutaneous or intravenous inoculation with blood taken during paroxysms.

3. There may be only a slight glandular reaction without "blue bodies" being discoverable, or it may be marked, and associated with the presence of "blue bodies."

4. The causal parasite may be present in the corpuscles up to 95 per cent., depending upon the severity of the case. It persists in the blood after apparent recovery.

5. In very severe cases there may be jaundice. Acute cases in which parasites are present in the blood in considerable numbers may escape unnoticed since no external symptoms are presented. Chronic forms of the disease may be characterized by diarrhoea and cachexia after the parasites have disappeared from the circulation.

The disease is a theileriasis similar in all respects to Egyptian fever, but it is premature to identify it with East Coast fever.

ZELLER & HELM. **Versuche zur Frage der Übertragbarkeit des Texasfiebers auf deutsche Rinder durch die bei uns vorkommenden Zecken** *Ixodes ricinus* **und** *Haemaphysalis punctata cinnabarina.* [The Transmissibility of Texas Fever to German Cattle by *Ixodes ricinus* and *Haemaphysalis punctata cinnabarina.*]—*Berlin. Tierärzt. Woch.* 1923. Jan. 4. Vol. 39. No. 1. p. 4.

Early in January, 1921, 733 cows and 30 calves arrived in Bremen from America. As the great majority had come from Texas it was certain that some carriers of redwater infection would be included.

On arrival a blood smear was made from every animal, and these were distributed to a number of institutes for examination. In no case could a definite diagnosis of Texas fever be made, although bodies suspected of being piroplasms were found in some of the smears.

Two German cows were inoculated intravenously with some of the suspected blood, and a week later they developed the disease. Parasites were found in their blood. Subsequently further inoculations confirmed the existence of Texas fever among the imported animals.

In view of the absence of information as to whether Texas fever could be transmitted by ticks occurring naturally in Germany, a number of experiments were carried out with *I. ricinus* and *H. punctata cinnabarina.*

The results indicated that at no stage of development could the progeny of female ticks which had been fed upon infected animals transmit the infection to German cattle in the case of *Ixodes ricinus.* It was found, however, in the case of this tick that larvae, the progeny of adults engorged upon the American cattle, were capable of transmitting anaplasmosis.

In the case of *H. punctata cinnabarina* the larvae and nymphs derived from adults fed upon American cattle were not found to be capable of transmitting Texas fever. It was found, however, that the adults of ticks of which the adults of the previous generation and the nymphs had engorged themselves upon Texas fever infected animals were capable of transmitting the infection to German animals.

WENYON (C. M.). **Coccidiosis of Cats and Dogs and the Status of the** *Isospora* **of Man.**—*Ann. Trop. Med. & Parasit.* 1923. July. Vol. 17. No. 2. pp. 231–288. With 6 plates & 2 text figs.

Dealing with the literature regarding the occurrence of coccidia in cats and dogs, the author points out that almost without exception the view has been held that only one species of coccidium was parasitic

in the cat or dog. There has been no proof furnished regarding the identity or otherwise of these.

Wenyon's own observations have revealed the existence of at least three species of Isospora in these animals. They are readily recognizable by their size alone. They measure 12–15μ, 25–30μ, and 40–45μ, respectively, in their long diameter. It appears to be probable that the smallest parasite—*Isospora bigeminum*—is not the same in the cat and the dog, since that found in the dog is, on an average, half as large again as that occurring in the cat.

It is known that dogs are sometimes the hosts of a parasite belonging to the genus *Eimeria*. This parasite is remarkable for the great variation in size of the mature oocyst. In this respect the organism resembles *Eimeria debliecki* of the pig.

Isospora felis.—The salient points of the life-cycle of this parasite are as follows: The schizonts retain an elongated gregariniform shape throughout their existence. They give rise to eight merozoites, as a rule, but the number is not absolutely constant.

The microgametocyte, like the schizont, retains a gregariniform shape for a considerable length of time. After division of the nucleus into a number of smaller nuclei the formation of microgametes begins by the outgrowth from the nucleus of a short process; this is followed by elongation of the whole nucleus. It has been calculated that more than 2,000 microgametes may be derived from a single microgametocyte.

The macrogametocyte, like the phases already described, retains its elongated shape, and this may lead to the parasite becoming doubled on itself. A number of deeply staining irregular bodies appear in the cytoplasm, which is itself filled with vacuoles containing a clear refractile material. The dark-staining granules subsequently disappear, and the envelope is secreted round the parasite. This envelope does not appear to acquire its full thickness until the organism leaves its epithelial cell.

This parasite invades the epithelium only, and appears to limit its invasions to the cells covering the summits of the villi.

The oocysts measure 39–48μ by 26–37μ. No development of the oocyst takes place until it has been voided in the faeces.

Isospora bigemina.—This parasite is peculiar in that it is not an invader of epithelial cells, but of the subepithelial tissues, and also in that the oocysts undergo complete sporulation while still in the tissues of the host. Owing to its small size the stages of development are very difficult to make out in sections, but the life-cycle appears to run parallel with that of other coccidia. It is noted that in the sporulated oocyst the envelopes surrounding the sporocysts are distinctly thicker than the oocyst.

Isospora rivolta.—This parasite has been studied in the oocyst stage as found in the faeces of the dog. In this phase the parasite resembles *Isospora felis*, but is smaller. The measurements are 20–24μ in length by 12–15μ in breadth.

Eimeria canis.—This parasite was recorded by Brown & Stammers. As already mentioned, the oocysts are very variable in size. It ranges from 18–45μ in length by 11–28μ in breadth. The oocyst is described as having a distinct pink tinge, and what seemed to be the true oocyst wall was enclosed in a somewhat irregular thick membrane, which gradually peeled off during development outside the body.

It has been suggested that *Eimeria canis* is identical with *Eimeria stiedae*.

The paper concludes with a valuable bibliography.

REITSMA. (K.). **Coccidiosis der Ziege.** [Coccidiosis of the Goat.]—*Zeitschr. f. Infektionskrankht. parasit. Krankht u. Hyg. d. Haustiere.* 1923. July. Vol. 25. No. 1. pp. 50–63. With 2 plates.

The author records the occurrence of fatal coccidiosis of goats in Holland. Coccidiosis was diagnosed in 12 cases out of 85 goats examined post-mortem, and in nine of these death was probably due to the infection.

The parasite may be responsible for a fatal infection in young animals, but adults do not succumb to it.

In two cases necrotic foci were found in the liver, and microscopic examination of these showed that they were composed of degenerated liver cells and coccidia. Contrary to what is the case in the rabbit parasites were not found in the epithelium of the bile ducts, but in the liver cells themselves. This suggests to the author that the invasion of the liver took place via the blood-stream.

The principal lesion found in the intestine took the form of chalky-white granular-looking nodules, ranging in size from a pin's head to 3–4 mm. in diameter. They were generally more or less rounded in shape. They were raised about 2 mm. above the level of the mucous membrane, were firm to the touch and sharply circumscribed. On section these lesions were found to be essentially of a proliferative character.

SPIEGL (A.). **Beitrage zur Pathologie der Schafkokzidiose und zur Entwicklung des Schafkokzids.** [A Contribution to the Pathology of Coccidiosis of the Sheep, and the Development of the Coccidium.]—*Zeitschr. f. Infektionskrankht. parasit Krankht. u. Hyg. d. Haustiere.* 1923. May. Vol. 24. No. 4. pp. 316–325. With 1 plate.

The author refers to two outbreaks of the disease which came under his notice.

The types of parasites found in the lesions are described.

With regard to the control of the disease he advises that the animals should be placed in clean stables daily, as in experiments it was found that sporulation may take place as early as the 35th hour.

PHISALIX (Mme.). **Coccidiose des voies biliaires d'un lézard de la famille des Scincidés le** *Scincus officinalis* **Laur.** [Hepatic Coccidiosis of a Lizard belonging to the Family Scincidae.]—*Bull. Soc. Path. Exot.* 1923. June 13. Vol. 16. No. 6. pp. 408–409.

The coccidium was found invading the liver and gall bladder only, and in adults. The invasion appeared to be of some standing because no schizogonous phases were observed. The oocysts measured from 31–35μ by 18–20μ. They were irregularly ellipsoidal in shape. The membrane was very thin and permeable to stains. The contents were finely granular, and contained a central refractile nucleus.

In the next phase the contents had shrunk to a central ball-like mass, the enclosing membrane was thicker and was definitely double-contoured. It was impermeable to stains.

The parasite was tetrasporous, the processes of sporoblast, sporocyst, and sporozoite formation following the ordinary course.

WALZBERG. **Zur pathologischen Histologie der natürlichen Toxoplasmose des Zeisigs.** [The Pathological Histology of Naturally Contracted Toxoplasmosis of the Greenfinch.]—*Zeitschr. f. Infektkrankht. parasit. Krankht. u. Hyg. d. Haustiere.* 1923. July. Vol. 25. No. 1. pp. 19–33. With 2 plates.

Until recently toxoplasmosis was considered to be confined to tropical and subtropical countries, but evidence is accumulating that it is at least not uncommon in Europe. It has been reported in the squirrel in England, in the chaffinch in France, and the author now records its occurrence in the greenfinch in Germany. The first case was observed there in 1919, and subsequently a number of the birds (19) were obtained from the same source for experiment. Of these 10 were found to be infected. The intestine and pancreas were the principal seats of the parasite, but they were found in the liver, spleen, and occasionally in smears from the lungs and kidneys. There were no very marked lesions in the affected viscera. The spleen, however, was three or four times the normal size.

Microscopic examination was made of sections from the brain, muscles, spleen, liver, kidneys, lungs, and intestine.

The author was unable to find the parasite in sections of the brain. This is in direct contradiction to ARANTES' findings of toxoplasma in large numbers in the brains of experimentally infected pigeons. Similarly, Walzberg failed to confirm ARANTES' findings of parasites in the head muscle and gizzard wall.

The spleen showed thickening of the capsule and trabeculae. Toxoplasma was present in large numbers, usually as a rounded or pear-shaped structure, either included within cells, or lying free.

In the liver the columnar arrangement of the cells is distorted by cellular infiltrations. The interlobular vessels were congested. Parasites were found free in the blood-stream or included within cells. The liver showed some degree of fatty degeneration.

The kidneys showed parenchymatous degeneration, but parasites were very scantily present.

The lungs were congested, and parasites were present in very small numbers only.

The intestinal vessels showed marked congestion, and the tissues appeared to be oedematous.

VERGE (J.). **L'entéro-hépatite des Dindonneaux.** [Entero-hepatitis (Blackhead) of Turkeys.]—*Rev. Gén. Méd. Vet.* 1923. Aug. 15. No. 380. pp. 421–429.

The author summarizes existing knowledge of this disease, but has nothing new to add.

FRANCHINI (G.) & SAINI (M.). **Sur la présence d'Hémogrégàrines chez les poissons d'eau douce de France.** [The Presence of Haemogregarines in Fresh-water Fish in France.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 353–361. With 2 text figs.

DESCHIENS (R.). **Variations tinctoriales et morphologiques de** *Giardia intestinalis.* [Variations in the Morphology and Staining Reactions of *Giardia intestinalis.*]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 323–325. With 1 text fig.

LIGNIÈRES (J.). **Sobre los experimentos de transmisión de la piroplasmosis bovina a ovinos efectuados en la República Oriental del Uruguay.** [A Criticism of the Experiments carried out in Uruguay regarding the Transmission of Bovine Piroplasmosis to the Sheep.]—*Revista Zootécnica.* 1923. July 15. Vol. 10. No. 118. pp. 193–195.

MARCHOUX (E.). **Action du Stovarsol contres les Lamblies.** [The Effect of Stovarsol (Oxyaminophenylarsenic Acid) on Lamblia (Giardia).]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 325–326.

DISEASES DUE TO METAZOAN PARASITES.

JACK (R. W.). **Tsetse Fly. A Four Years' Experiment in Game Elimination.**—*Rhodesia Agric. Jl.* 1923. Apr. & June. Vol. 20. Nos. 2 & 3. pp. 207–223. With 1 map; pp. 329–348.

The author records observations made during the course of an experiment carried out over four years, in which the effect upon the tsetse-fly of vigorously hunting big game was tested. The area covered was approximately 500 square miles.

Nearly 5,000 head of game were killed, but there was no approach to extermination, on account of immigration of animals into the area.

The operations resulted in approximate banishment of big game during the daytime from the haunts of the fly. The fly diminished greatly in numbers throughout the area, and apparently disappeared completely from a considerable part of it. This disappearance appeared to be effected more readily in the accessible portions of the area, but the fly persisted more tenaciously in broken or thick country or in country which, on account of the absence of permanent water, was not hunted so thoroughly. The extension of the fly area, which had been steadily progressing for years, appeared to come to a stop in the experimental area during the first year of operations. Extension continued on either side of it.

There appeared to be no doubt that the destruction of the game was directly responsible for the checking of the fly, indicating that *G. morsitans* is dependent upon large game.

Although the operations did not succeed in actually clearing any area of flies, the author thinks that the results obtained in the more open areas were such as to suggest that in favourable localities, or where land is valuable, the elimination of *morsitans* by organized hunting might not prove uneconomic. The cost of the author's experiment amounted to 4½ pence per acre (presumably for the whole period).

BROWN (W. G.). **Sheep Blow Fly Pest. A Review of Experiments since 1913.**—*Queensland Agric. Jl.* 1923. July. Vol. 20. No. 1. pp. 13–14.

The material contained in this note has appeared elsewhere [see this *Bulletin*, 1923, Feb., Vol. 11, No. 1, p. 17].

VAN SACEGHEM (René). **L'Oestre du Mouton au Ruanda.** [*Oestrus ovis* in Ruanda.]—*Bull. Agric. Congo Belge.* 1923. June–Sept. Vol. 14. No. 2–3. p. 393.

Oestrus ovis is found in Ruanda at the beginning of the rains (September–October) and during the rainy season. The parasite is the cause of serious losses among sheep and goats.

CAMPBELL (J. G. C.). **The Stickfast Flea.**—*Western Australia Dept. of Agric. Bull.* No. 104. pp. 1–16. With 8 text figs.

The stickfast flea (*Echidnophaga gallinacea*) is a parasite of poultry, and has caused immense losses in Western Australia. It was first described by WESTWOOD, in 1875, who examined specimens from Ceylon. Its existence has since been recorded in Russia, Italy, China, Japan, in many parts of Africa, Mexico, the United States, and Hawaii. In Australia it is only known to be the cause of loss in Western Australia.

The parasite belongs to the same family as the "Jigger" or "Chigoe." The genus *Echidnophaga* is represented by nine species, of which five have been found in Australia.

While it is only three years since the flea was identified, general opinion is that it has been known as a cause of losses for many years.

Unlike most of the fleas, the stickfast flea shows a remarkable impartiality as regards its hosts. Its preference for fowls is probably due to the fact that the habits of the bird are favourable to it, but any species of animal may become parasitized by it. Dogs and cats are the most likely hosts after the fowl. It has been found on a wide range of animal and bird hosts, and man is not exempt from its attacks.

On both birds and animals the fleas tend to congregate where there is little or no covering of feathers or hair. In poultry the bare parts of the head are the principal areas of attachment. In cats they are found round the eyes and mouth and between the toes.

The fleas bury their mouth parts into the host, leaving the body projecting at right angles to the surface.

The symptoms produced depend upon the severity of the infestation, and are due to the withdrawal of blood

The parasite is not known to be a carrier of disease, but it is worthy of note that it has been found on rats during plague epidemics.

Life-history.—For development to maturity a period of about four weeks is required. The eggs are oval in shape and measure about 300 μ in length. Hatching requires about four days. The resulting larva measures about a millimetre in length, and comprises 13 segments, excluding the head. There is a ring of hairs round the hinder margin of each segment, and the cuticle is tuberculated. The head has a pair of short, thick antennae, and a mouth provided with strong jaws. The habitat of the larva is beneath the surface of the soil. During the larval period two or three moults occur, and when full grown the larva measures about three millimetres in length.

Pupation takes place about 6 in. below the surface of the soil, and the pupal period lasts about 14 days.

The adult flea is dark brown in colour and when newly hatched measures only about one millimetre in length. Females, after fertilization, increase in size, and as the egg masses develop in the abdomen, become paler in colour.

The stickfast flea differs from ordinary fleas in that it remains attached to its host by its proboscis, and does not wander about, biting only when it requires to feed. In consequence of this habit the legs are not so powerful as in ordinary fleas. Observation goes to show that egg-laying is for the most part accomplished during the night, and that a meal of blood is necessary before a female can lay eggs.

The duration of life is variable. Life appears to be limited to about a week during hot weather, but may be longer during the winter. When food is abundant females outlive the males, and may lay eggs for three to six weeks. Males rarely survive a week after mating. When fleas are starved the females are first to succumb.

During development a temperature of 80° F. and a humidity of 80 degrees were found to be most favourable. An excess of moisture in the soil is fatal to the larvae.

Experiments with Insecticides.—Limewater was found to be destructive to the eggs. The vapours of 5 per cent. solution of phenyle, and carbolic acid, 2 per cent. cyllin, kerosene, kerosene emulsion, camphor, and naphthalene were found to be fatal to larvae.

Various greasy and oily substances were found to be effective for the destruction of the mature fleas. It was not necessary to mix any disinfectant with them.

DUNN (Lawrence H.). **The Ticks of Panama, their Hosts, and the Diseases they transmit.**— *Amer. Jl. Trop. Med.* 1923. Mar. Vol. 3. No. 2. pp. 91–104.

This paper contains an account of the species of ticks received by the author at the Ancon laboratory and identified with certainty.

Argas miniatus.—Prefers the fowl, but attacks other hosts. Larvae remain attached while engorging, but nymphs and adults feed at night. It is known to transmit *Spironema gallinarum.*

Ornithodorus talaje.—This parasite is known as the human tick in the adult stage. Larvae and nymphs attack the black and the brown rat.

Dermacentor nitens.—The tropical horse tick. This tick usually attaches itself to horses or mules, but is occasionally found on other hosts. The inside of the ears is the predilection place of attachment. The preoviposition period is 5–7 days. Oviposition takes from 8–16 days, and the shortest period of incubation recorded is 25 days. It is probably the transmitting tick of equine piroplasmosis in Panama. DARLING (1913) recorded the occurrence of *P. caballi.*

Rhipicephalus sanguineus.—This tick is exceedingly common on dogs in Panama. The usual places of attachment are between the toes and in the ears. The tick transmits canine piroplasmosis, a commonly occurring disease on the Isthmus. The screw-worm fly, *Chrysomyia macellaria,* frequently deposits its eggs in the lesions caused by the bites of this tick.

Ixodes ricinus.—Only one specimen of this tick has been examined.

Margaropus annulatus.—This is the transmitting tick of Texas fever in the Southern United States. It has been found in Panama, but is not common.

Margaropus annulatus australis.—This appears to be a variety of the above, and is to be found on practically all cattle in the zone. It is sometimes found on dogs.

The tick transmits *B. bigemina,* and practically all the native cattle are infected with this parasite.

Haemaphysalis leporis-palustris.—Is not a commonly occurring parasite of the rabbit and hare in Panama.

Haemaphysalis kochi.—Has been found on deer.

Amblyomma cajennense.—The most common species of Amblyomma found. It attacks man and all species of animals indiscriminately. It has not been incriminated in the transmission of disease.

Amblyomma darlingi.—This differs in minor details only from the above.

Amblyomma americanum.—The lone star tick. Found on dog and hog on an island in Panama Bay, but not yet recorded from the mainland.

Amblyomma dissimile.—Is the prevalent tick on cold-blooded animals.

Amblyomma longirostre.—This tick has been found on porcupines. It is notable for the deep penetration of the mouth parts into the skin while engorging.

Amblyomma nodosum.—The three-toed ant-eater is a common host of this tick in its adult phases. Larvae and nymphs have not been found.

Amblyomma varium.—This tick is frequently found on the two-toed sloth. An engorged female was found to measure 30 mm. in length, 24 mm. in width, and 15 mm. in thickness. It weighed nearly 6 grammes.

Amblyomma humerale.—Found on a tortoise.

Amblyomma parvum.—The adults of this species were found on a white-tailed deer. Larvae and nymphs were collected in large numbers from cotton rats.

Amblyomma naponense.—Found on an ant-eater and a collared peccary.

Amblyomma ovale.—Specimens were obtained from an ant-eater.

MacArthur (W. P.). **Tick Paralysis.**—*Jl. Royal Army Med. Corps.* 1923. Aug. Vol. 41. No. 2. pp. 81–86.

Cases of tick paralysis observed by Nash in British Columbia are recorded in this paper.

The ticks live on the sage brush of the uncultivated land. When they attach themselves to human beings the head and the nape of the neck are favourite locations. Four cases of paralysis in human beings associated with the presence of a tick on the body are referred to.

Ticks sent for identification were found to be *Dermacentor venustus*, but no definite statement was received that these had been collected from patients.

The greater part of the paper is a recapitulation of the literature on tick paralysis.

The symptoms in human beings are: An acute, flaccid, ascending motor paralysis without sensory changes. In general, it commences in the legs, but in severe cases the muscles of the trunk, arms, head, and neck may be involved with interference with speech and deglutition. Prognosis is favourable and recovery rapid if the tick be removed before the muscles of respiration are involved.

Rabagliati (D. S.). **An Outbreak of Demodectic Mange in Cattle.**—*Vet. Jl.* 1923. Aug. Vol. 79. No. 8. pp. 275–280.

The outbreak occurred among a herd of Egyptian bulls (with a few Cyprus steers) used for cattle-plague serum production. The animals were in good condition and were kept under good hygienic conditions.

The ground on which the mat-covered sheds stood had been used for cattle for many years prior to the war. During the war it was used as a horse remount depot.

The first case occurred about two months after the sheds had been again taken over for serum work. In spite of repeated clippings and dressings with oil and sulphur preparations a cure was not effected. The animal remained in contact with other animals for 23 months without any other case being discovered. Four and a half months after this bull had been destroyed two further cases occurred, but these were in sheds remote from each other and from the shed in which the original case had occurred. At intervals of a few weeks further cases were found, and with a view to accurate determination of the extent of the invasion all the animals (110 in number) were cast and carefully examined. It was found impossible to make a satisfactory examination

while the animals were in the standing position. Forty-eight per cent. were found to be infected, although many of these had not more than two or three pustules.

In no case did the disease produce any pruritus, and in one case only was there any denudation or thickening of the skin. The nodules ranged in size from a millet seed to a pea. From the larger ones yellow caseous pus could be obtained by pressure alone, but the smaller ones required incision.

In no case was there any elevation of temperature. Pustules were found on almost all parts of the body with the exception of the head and the legs below the knees and hocks.

Oil and sulphur dressings were found to be useless. Subcutaneous injections of arrhenal were also found to be inefficacious. Finally, spraying and dipping with Cooper's dip (1–150) were practised weekly and fortnightly, and were continued until improvement occurred.

The difficulty of detecting slight cases raises the question as to whether the disease is as rare as is believed in cattle. In view of this difficulty it cannot be said with certainty that the first case detected was the first or even the only case of infection at that time.

Since the outbreak was apparently stamped out other cases have occurred, and some of these among animals introduced after the apparent cessation of the original outbreak. There appears to be no doubt that these animals became infected after purchase. This indicates the difficulty of eliminating the disease from infected premises.

SALM (G.). **Sur un nouveau Trombidiide,** *Schöngastia salmi* **(n. sp.).** [A New Trombidiid, *Schöngastia salmi* n. sp.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 336–340. With 2 figs.

This Trombidium, of which, in spite of continual searching, only one specimen has been discovered, was found at Magelang, in Java. Its host is unknown.

NOC (F.). **Sur l'embryon acariforme et les stades larvaires des Linguatulidés.** [The Acariform Embryo and the Larval Stages of the Linguatulidae.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 340–346. With 6 text figs. and 1 plate.

As a result of his investigations regarding the embryo and larval forms of *Armillifer armillatus*—parasitic on pythons in West Africa—a species of *Raillietiella* from the gecko, in Cochin-China, and of a *Linguatula* of *Varanus monitor* in Senegal, the author concludes that, while the Linguatulidae are correctly placed as approximating to the Acarina, they form, in reality a special group.

MAPLESTONE (P. A.). **A Revision of the** *Amphistomata* **of Mammals.** —*Ann. Trop. Med. & Parasit.* 1923. July 12. Vol. 17. No. 2. pp. 113–212. With 4 plates and 32 text figs.

While it is impossible to make an extract of any value of a paper of this magnitude, it may perhaps be useful to abstract the author's introduction as indicating the reasons for undertaking the work.

The classification of STILES and GOLDBERGER (1910) was adversely criticized by BRAUN (1911), ODHNER (1911), and LOOSS (1912) on the ground that the then recent attempts to classify Trematodes by using

affinities in the lymphatic and excretory systems as a basis had been ignored. Reference is made to STUNKARD's (1917) provisional classification, and it is rejected as not improving matters. Looss's suggestion to classify the members of the group on the minute anatomy of the lymphatic excretory and copulatory systems is probably sound, but it appears to be too complicated for practical purposes.

The author's classification is based upon easily ascertained anatomical characters. It does not take cognizance of the standards required by the more advanced systematists, but it is claimed that the system is reasonably simple and consistent, and enables a species to be determined with considerable accuracy.

VEVERS (G. M.). **Observations on the Genus *Paragonimus* Braun with a Redescription of *P. compactus* (Cobbold, 1859) 1899.**—*Jl. Helminthology.* London. 1923. Mar. Vol. 1. No. 1. pp. 9–20. With 4 text figs.

The author has found lung flukes in five mammalian hosts dying in the Zoological Gardens during the last three years.

He has been able to confirm WARD and HIRSCH's view that the cuticular spines are recognizably different in the various species. Size and shape of the body, and the details of the internal organs have been found to be valueless for the purposes of recognition.

P. kellicotti, *P. ringeri*, and *P. westermanii* have been recognized, and on three occasions *P. compactus* has been found. It is emphasized that care must be taken to examine the spines from the same area always. The most convenient places are the area midway between the oral and ventral suckers, and the clear area between the testes.

The genus may be divided into two groups. In one (*P. ringeri* and *P. compactus*) the spines are arranged in clusters. In the other (*P. westermanii* and *P. kellicotti*) they are scattered singly.

The eggs of the four species differ from each other in point of size, but individual eggs of the same species vary also.

P. ringeri appears to be confined to China and Japan. In India *P. compactus*, *P. westermanii*, and *P. kellicotti* occur. So far as is known, *P. kellicotti* is the only species endemic on the American continent.

WALTON (C. L.). **Liver Rot of Sheep.**—*Jl. Ministry of Agriculture.* 1923. Aug. Vol. 30. No. 5. pp. 446–450.

The species of snail, *Limnaea truncatula*, *L. peregra*, and *L. palustris*, have been found in North Wales, but no incriminating evidence has as yet been found against the last of these.

Field experiments were made with sulphate of ammonia, which was reported by KHALIL to be fatal to the egg masses of *L. peregra* and *Planorbis corneus* in six hours in a dilution of 1 : 1,000. It was found to be of little value.

Copper sulphate, on the other hand, was found to be very effective but special care is necessary if it is used.

Several ditches which had been cleared of snails by means of copper sulphate 18–24 months previously were found to be free.

In another instance several large damp grass fields, which were swarming with *L. truncatula*, were ploughed and put under oats.

Only two specimens were found during subsequent examinations. The fields were again seeded down with oats and the resultant grass fields were practically clear of snails.

The value of ducks for keeping down the snail population was demonstrated in many cases.

JONES (S. B.). **Intestinal Bilharziasis in the West Indies: Intermediate Host.**—*Jl. Trop. Med. & Hyg.* 1923. Aug. 1. Vol. 26. No. 15. pp. 253–254.

The author has found that the probable intermediate host of the parasite in the West Indies is *Planorbis antiguensis*. The disease occurs in Guadeloupe, St. Martin, St. Kitts, Antigua (probably), San Domingo, and Porto Rico.

RAO (M. A. N.). **Observations on the Morphology and Life-Cycle of *Filaria recondita* Grassi.**—*Bull.* 144. *Agric. Res. Inst., Pusa (India).* 1923. pp. 1–7. With 2 plates & 1 chart.

During a period of six months the author has examined the blood of 299 dogs admitted as in-patients at the Madras Veterinary College, and has detected seven cases of microfilariasis.

The parasite measures 220–250 μ in dried films, and appears to be slightly longer while alive. The breadth is 4–5½ μ. At room temperature in hanging drop preparations nearly all the parasites are immobile after 24 hours. At body temperature death occurs sooner (16 hours), while in an ice-box parasites were found still active up to 48 hours.

Parasites are far more numerously present in the blood during the night then during the day; it is, in fact, scarcely possible to find them then. It is noted that if an infected dog be kept in the dark the peripheral blood may contain parasites in considerable numbers during the day. Blood obtained by pressure from different organs was examined, and the enumerations made appeared to indicate that they were most numerous in the lungs, the liver, kidneys, spleen, and glands following in order. In spite of this, however, the author found worms in larger numbers in sections from the liver than in those from the lungs. Post-mortem examinations were made in three cases, and the lesions were identical in all of them. There was general evidence of anaemia. The liver was enlarged, and showed whitish areas ranging in size from a mustard seed to a walnut. Microscopic examination showed areas of caseation surrounded by zones of fibroblasts. The spleen was enlarged. The kidneys showed parenchymatous degeneration, and slight interstitial proliferation with an infiltration of leucocytes. The sublumbar glands were as large as small oranges, and showed a few haemorrhages. These on section showed hyperplasia and caseation.

The active embryos in the blood were observed to attach themselves to the cover glass in moist preparations, and rapidly shoot out and withdraw a minute "spine" from the anterior end. They showed no sheath. In stained specimens the granules in the body are well seen. The anterior extremity is devoid of them, and there are three areas free of them in the body. The granules are larger and more closely packed than those seen in *Filaria bancrofti*, and they appear to be arranged spirally. FÜLLEBORN's vital staining showed that the stain diffused through the parasite at the V spot, suggesting that this forms a rudimentary excretory or water vascular system. Posteriorly the parasite tapers to a fine point.

A few specimens of Culex and Stegomyia, caught near the kennels, were dissected, and in the gut of more than 30 per cent. of the former microfilariae were found. Very few Stegomyia showed them, and then only in small numbers.

Both insects were bred and were used for experiments with infected dogs. As no specimens of Stegomyia were found to become infected they were discarded.

In experiments with Culex parasites resembling those found in the blood were detected in the mid-gut within three hours of feeding on an infected dog, but they appeared to be more sluggish. Eight hours after feeding the parasites appeared to be stouter, but showed no increase in length. The cutaneous covering appeared to be thicker. After 36–48 hours the worms had left the gut, and had migrated to the muscles of the thorax. After about a week 9 per cent. of the mosquitoes showed short, thick " larval " forms in the muscles of the thorax. At this stage the parasites could be observed to make sluggish movements, while the caudal prolongation occasionally made rapid movements to and fro.

On the 15th day one of six Culex dissected showed two larvae in the mouth. LEBREDO's method of subjecting the head of a live mosquito to pressure in salt solution showed that the larvae escaped from the labium and from near the base of the proboscis.

WARE (F.) & (M.). *Strongyloides stercoralis* **in a Dog.**— *Jl. Comp. Path. & Therap.* 1923. June. Vol. 36. No. 2. pp. 104–108. With 3 text figs.

The authors record the occurrence of *Strongyloides stercoralis* in a dog for whose death it was certainly responsible. The subject was a black cocker spaniel bitch, about a year old. The interval elapsing between the onset of symptoms, the chief of which was diarrhoea, and death was about four months.

Larvae were first observed in the faeces ten days before death occurred, although careful examinations had been made weekly. Prior to this Ankylostome eggs had been detected in the faeces.

At the post-mortem examination the liver, spleen, and lungs were all congested and the heart dilated. The intestine showed two areas in which the wall was thickened. One of these was about 4 in. from the pylorus, and the other a few inches above the rectum. Between these thickened areas the wall was remarkably thin.

Smears made from any part of the wall showed great numbers of parthenogenetic Strongyloides females, rhabditiform larvae, and ova with contents in all stages from two cells to moving embryos. One Strongyloides female was found in the stomach.

Twelve specimens of *Ancylostoma caninum* were found in the intestine.

About six weeks before death occurred the animal showed symptoms of pneumonia, and although this may have been produced by the migration of the parasites, none could be found in sections of the lungs.

Sections of the jejunum showed that little or no damage had been done to the epithelium, and, contrary to what has been recorded by BLACKLOCK and ADLER in the chimpanzee, no parasites could be found in the substance of the gut wall. The thickening was mainly in the submucous coat.

The rhabditiform larvae in the faeces measured 0·355–0·44 mm. in length by ·02 mm. in thickness.

After 24 hours mature rhabditiform males and females, measuring 0·9 mm. and 1·35–1.45 mm. in length, respectively, were present in the cultures. These constitute the free-living stage of the parasite.

In a culture 38 hours old some rhabditiform larvae, the progeny of free-living adults, were found.

Ten hours later some of the second generation larvae had developed into the filariform infective stage.

By the fifth day all Strongyloides had disappeared from the culture.

For further morphological details the original paper must be consulted.

VAN SACEGHEM (R.). **La bronchite vermineuse des Bovidés au Ruanda.** [Verminous Bronchitis of Cattle in Ruanda.]—*Bull. Agric. Congo Belge.* 1923. Mar. Vol. 14. No. 1. pp. 50–56.

Parasitic bronchitis, due to *Dictyocaulus viviparus* and *Gordius viviparus* (*Strongylus micrurus*), is of frequent occurrence in Ruanda. It has occurred among the serum-makers belonging to the laboratory. These animals are grazed on grounds at 1,500–1,600 metres above sea-level. During the rainy season the fall is very heavy, and a not inconsiderable amount falls during the dry season. The temperature range is from 5° to 15° or 20° C. (shade temperature). Good pasturage is obtainable throughout the year.

In 1922 an outbreak of verminous bronchitis occurred and occasioned a mortality of 40 per cent. Young and adult animals were equally attacked. The author remarks that in every case in which a post-mortem was made there was marked gastro-enteritis.

The author describes the morphology and life-history of *Dictyocaulus viviparus.*

Intratracheal injections of turpentine, carbolic acid and creosote were useless. Transference of the animals to dry pastures was the only practical treatment. Animals should not be allowed out to graze until the dew has dried, moist herbage forming a vehicle for embryos. While larvae, according to the author's observation, are incapable of living in water, they thrive in the faeces of animals. These, therefore, should be spread thoroughly to ensure as rapid drying as possible.

RAILLIET (A.). **Les Strongles (anciens sclérostomes) et les strongyloses proprement dites.** [The Strongyles (formerly Sclerostomes) and the True Strongyloses.]—*Rec. Méd. Vét.* 1923. July. Vol. 99. No. 13. pp. 377–396.

This survey of the Strongyles and Strongyloses does not lend itself to abstraction, and should be consulted in the original by those interested.

GORDON (R. M.). **A Further Note on the Occurrence of Ancylostomes resembling** *Necator americanus* **amongst Domestic Pigs in Amazonas.**—*Ann. Trop. Med. & Parasit.* 1923. July 12. Vol. 17. No. 2. pp. 289–298. With 2 text figs.

In 1922 ACKERT and PAYNE described a hookworm from the gut of the domestic pig in Trinidad, and, though the parasite resembled *Necator americanus*, they came to the conclusion that the differences were of specific value. These authors based their opinion on the examination of ten anatomical features.

In the present paper the author takes these points seriatim and tabulates various measurements of Necators from the pig in Amazonas, the human host in Jamaica, and the human host in Amazonas, and arrives at the conclusion that no differences were found to be sufficiently constant to warrant the creation of a new species for the pig parasite.

DAUBNEY (R.). **The Kidney-Worm of Swine : A Short Re-Description of *Stephanurus dentatus* Diesing, 1839.**—*Jl. Comp. Path. & Therap.* 1923. June. Vol. 36. No. 2. pp. 97–103. With 5 text figs.

The author bases his description upon specimens from the Natural History Museum and from the collection of the Ministry of Agriculture. Attention is drawn to the confusion that has arisen over certain morphological features of this species, and, as is indicated by the title of the paper, a redescription is given. The paper must be consulted in the original by those interested in the details.

GOODEY (T.) & CAMERON (T. W. M.). **Observations on the Morphology and Life-History of *Ascaris columnaris* Leidy, a Nematode Parasite of the Skunk.**—*Jl. Helminthology.* London. 1923. Mar. Vol. 1. No. 1. pp. 1–8. With 5 text figs.

The parasite described in this paper has been found in large numbers in skunks raised on a skunk farm in England. The male parasite was about 9 cm. in length by 2 mm. in breadth, the female 22·5 cm. by 3 mm. For anatomical details the original should be consulted.

Life-history.—Eggs were obtained by dissection of females and cultured in 2 per cent. formalin at 33° C. At this temperature a large number of the eggs became embryonated in a fortnight. At room temperature it required about a month. Embryonated eggs were placed under coverslips upon slides and subjected to pressure. This resulted in the liberation of the embryos. Each embryo was found to be provided with a delicate sheath, and the average measurements were ·34 mm. by ·02 mm. Mice were fed with embryonated eggs, and on the fourth day they were found to be ill. Examination showed that embryos were present in the lungs and liver—more numerously in the former.

METALNIKOW (S.). **Les quatre Phagocytes d'*Ascaris megalocephala* et leur rôle dans l'immunité.** [The Four Phagocytes of *Ascaris megalocephala*, and their Rôle in Immunity.]—*Ann. Inst. Pasteur.* 1923. July. Vol. 37. No. 7. pp. 680–685. With 4 text figs.

In the course of his investigations regarding immunity in invertebrates the author has made use of *Ascaris megalocephala*, which can be kept alive for about 48 hours in salt solution containing white of egg at 37–40° C.

If a small quantity of powdered carmine or indian ink is introduced into the body cavity of the worm, within a few hours the particles are found to be collected in curious star-shaped structures, of which there are four in the coelom. These bodies are fixed by very slender filaments on the one hand to the exterior of the intestine, and, on the other, to the inner surface of the body wall.

Each phagocyte is an enormous cell, measuring from 1·5–2·5 millimetres in diameter, and possesses a nucleus sufficiently large to be visible to the naked eye.

Each of these structures comprises a cell with branching outgrowths. The nucleus contains a number of chromatic granules, and the cytoplasm surrounding it stains more intensely than the peripheral part. In some cases one can make out striae or fibrillae continuous with the axes of the outgrowths.

These outgrowths carry little rounded bud-like processes, measuring 2–12 μ in diameter, and when stained with methylene blue or Giemsa, each is found to contain a nucleus-like structure, which is in direct connexion with the axis of the process. The author considers that the axes of the processes and the striae in the main cell body represent a skeletal structure which is essential in so large a cell. The bud-like processes on the branches are analogous to the phagocytes of the higher animals, as has been shown by the injection of bacteria of various kinds into the body cavity of the worms. The bacteria are found to be enclosed in the globular projections within a few hours, and later may be quite unrecognizable as a result of their digestion. Living tubercle bacilli did not appear to be digested.

The blood of *Ascaris megalocephala* has been found to be without visible action on bacteria in vitro.

HESSE (A. J.). **On the Free-Living Larval Stages of the Nematode *Bunostomum trigonocephalum* (Rud.) a Parasite of Sheep.**—*Jl. Helminthology*. 1923. Mar. Vol. 1. No. 1. pp. 21–28. With 3 text figs.

Eggs were obtained by opening the uterus, and they were cultured in a suspension of faeces from the large intestine of the sheep.

At room temperature hatching required 48 hours to five days, depending upon the temperature. With incubation at 22° C. hatching took place in 24 hours.

The eggs measure ·085 mm. by ·05 mm. They are usually slightly flattened on one side, and the shell is thickened at one pole. Eggs in the terminal part of the uterus are in the 8 or 16-cell stage, but those in which the contents have only divided once develop in culture.

The larvae escape by breaking the shell to one side of one pole. They measure about ·5 mm. in length by ·02 to ·035 mm. in breadth. The oral aperature has six processes round it. There is a short buccal capsule. The oesophagus is usually flexed, its nuclei are visible, and it shows transverse striation. The chyle intestine shows eight dorsal and eight ventral cells bounding a lumen.

The elements of a nervous system are recognizable.

After 24 hours at 22° C. the larva becomes quiescent, the cuticle becomes loosened, and the new article of the second stage larva is formed.

At this stage the parasite is only slightly longer than in the preceding phase and is not broader.

After a period of 24 hours the second moult occurs. The old cuticle is not cast, but remains closely adherent to the larva. In this phase the parasite does not feed, and for its further development must gain access to a sheep. It possesses remarkable powers of resistance. It can retain its vitality for "some time" in formalin (strength not stated), a mixture of ether and alcohol, and concentrated solutions of pancreatin. It can withstand desiccation for an indefinite time.

Specimens have been kept alive in stagnant water for over a month, the only visible change being the disappearance of granules from the intestinal cells.

Experiments appeared to indicate that the parasite does not migrate up the blades of grass as does *H. contortus*.

FREEBORN (S. B.). **The Control of Suckered Round Worms of Poultry.** —*Cornell Vet.* 1923. July. Vol. 13. No. 3. pp. 223–231.

The author's conclusions are as follows :—

Tobacco dust, containing 1·5–2 per cent. nicotine, mixed in the proportion of 2 per cent. of the dry mash and fed for one to four weeks, expels practically all the intestinal worms and about 80 per cent. of the caecum worms. Tobacco infusions are not recommended for the round worm, for, although they are effective, they are toxic, difficult to administer, and have little effect on the caecum worms. Chenopodium, derrid (" derrisene "), and carbon tetrachloride were unsatisfactory for the removal of these worms. Nicotine has apparently little effect upon the common tape worm of poultry, *Choastaenia infundibuliformis* Goeze.

BOULENGER (C. L.). **A Collection of Nematode Parasites from Zanzibar.**—*Parasitology.* 1923. June. Vol. 15. No. 2. pp. 113–121. With 5 text figs.

Sixteen species have been identified, the majority being well-known round worms. Reference is made to these only for the purpose of indicating distribution.

Heterakis dahomensis from the African rat, *Ascaridia lineata* from the stomach of a chicken, *Subulura otolicni* from the caecum of *Galago garnetti*, and *Physaloptera praeputialis* from the cat and leopard, are described at some length.

VEVERS (G. M.). **New and Little Known Helminths from British Guiana.**—*Jl. Helminthology.* London. 1923. Mar. Vol. 1. No. 1. pp. 35–45. With 3 text figs.

While in British Guiana the author found 11 species of entozoa in birds and mammals. Three species were new and one was placed in a new genus *Trypanoxyuris*.

The new species were as follows :—

Contracaecum andersoni.—Small intestine. Little blue heron.

Trypanoxyuris trypanuris.—Caecum. *Pithecia monachus* (Humboldt's saki).

Raillietina (*Skrjabinia*) *bodkini*.—Small intestine. Spotted sandpiper.

SHEATHER (A. Leslie). **The Detection of Worm Eggs in the Faeces of Animals, and Some Experiments in the Treatment of Parasitic Gastritis in Cattle.**—*Jl. Comp. Path. & Therap.* 1923. June. Vol. 36. No. 2. pp. 71–90. With 1 text fig.

After a number of experiments the following technique was fixed upon as yielding the most constant results with the least expenditure of time and with the simplest apparatus.

The faeces are diluted with water until they are quite liquid and are passed through a wire screen having 30 meshes to the linear inch. The filtered liquid is mixed with an equal volume of a solution of sugar

made by dissolving one pound of sugar in three-quarters of a pint of water (with the aid of heat). The mixture is centrifuged for two minutes at about 2,000 revolutions per minute. By the end of this time the eggs (except those of the liver fluke) have risen to the top of the liquid. To collect the eggs a piece of plasticine, which is shaped into a blunt point bent at a right angle and attached to a wooden handle, is pressed on to the centre of the surface of a cover-glass of such size that it will just enter the mouth of the centrifuge tube. By this means the cover-glass is lifted and lowered on to the surface of the liquid so that it is in contact throughout its extent. It is then raised again with a slight tilt, to reduce the quantity of liquid lifted by it, and dropped off the plasticine on to a slide.

The experiments in the treatment of parasitic gastritis were carried out on ten yearlings which were the hosts of *Ostertagia ostertagi*. Turpentine, copper sulphate, a mixture of copper sulphate and sodium arsenite, tartar emetic and carbon tetrachloride were tried, but without any success.

Carbon tetrachloride appeared to be a dangerous drug for cattle; a dose of 25 cc. was probably responsible for the death of an animal treated with it.

CAWSTON (F. G.). **Possible Hosts for the Bilharzias in Portuguese East Africa.**—*Jl. Trop. Med. & Hyg.* 1923. July 2. Vol. 26. No. 13. pp. 228–229.

BACTERIAL DISEASES.

VELU & JALABERT (H.). **Essais de diagnostic de la fièvre de Malte chez la chèvre par les reactions allergiques.** [The Diagnosis of Undulant Fever in Goats by Allergic Reactions.]—*Rec. Méd. Vét.* 1923. July 30. Vol. 99. No. 14. pp. 311–321.

The author points out that from a clinical point of view the diagnosis of undulant fever in goats is beset with difficulties for the reasons that many infected animals present no symptoms, and that symptoms such as abortion, mastitis, orchitis, etc., are neither constant nor specific.

Laboratory tests have not yielded a certain method of diagnosis. Irregularities of an obscure nature have been encountered by a number of investigators in applying the agglutination test.

The author has used a filtered broth culture for diagnostic purposes. Cultures were grown in peptone broth for 20 days, heated to 62° C. for half an hour, filtered through a Chamberland filter and preserved by the addition of 0·5 per cent. phenol.

The author gives the details of a number of tests in which the filtrate was injected intradermally and subcutaneously. For the former the dose ranged from 0·25–1·0 cc., and for the intradermal test 0·1–0·2 cc. were used. Agglutination tests were carried out for comparison.

In the first test the lower eyelid was used for the intradermal injections, but the thickness of the skin rendered the reading of the results difficult, more especially as the reactions obtained were very slight. Subsequently the anal folds were used, as in the case of the tuberculin test.

The author describes the characters of the swelling of the fold in a positive reaction, and these appear to resemble those obtained in the case of tuberculin tests, but he gives no indication as to the time elapsing between the injection and the appearance of the reaction, nor of its duration.

Subcutaneous injections of 1 cc. on the side of the chest, in the anal fold, or into the lower eyelid have not produced any thermal or general reaction of any kind.

With regard to the concordance with the results obtained in the agglutination tests the authors' statements are as follows :—

1. When the first intradermal reaction has given a negative result the agglutination test has in no case been positive.

2. In fresh animals when the agglutination test has been positive the first intradermal test has yielded a positive result.

3. Positive agglutination tests have not been obtained in all cases in which the first intradermal test has been positive.

Comparisons of the results obtained in a succession of tests in herds appear to indicate that when tests are repeated the results are likely to be discordant. The lapse of a month between tests does not appear to be a sufficiently long interval to permit of the obtaining of concordant results.

CÉSARI (E.). **La prophylaxie vétérinaire de la fièvre méditerranéenne.** [The Prevention of Undulant Fever from the Veterinary Point of View.]—*Rec. Méd. Vét.* 1923. Aug. 30. Vol. 99. No. 16. pp. 327–359.

In the first few pages of this paper the author deals briefly with the symptoms of the disease in man, its history and geographical distribution. The difficulty of intervening for the purpose of preventing the spread of the disease in countries lightly infected, or of preventing its introduction into those which are, so far as is known, free, lies in incomplete knowledge of all the factors concerned. He states that existing knowledge is not sufficient to permit of a rational attack on the disease, as it occurs in goats.

Reliance has been placed upon the agglutination test for diagnosis, but it is pointed out that recent observations have shown that this is not specific, since parallel results are obtained when the abortion bacillus is used, and that even apart from this there appears to be no agreed standard as to what indicates a positive result.

Animal experimentation with small animals is not sufficient to effect a differentiation between the two organisms.

The author suggests that it is not an improbable supposition that Bang's bacillus may have become changed into Bruce's organism as a result of some external factor acting upon it.

Among a mass of details, regarding which there is no degree of certainty, one fact stands out as established, namely, that under natural conditions undulant fever in man is almost invariably associated with contamination from an animal source.

In spite of the most scrupulous care, cultures of the *Micrococcus melitensis* are extremely dangerous to handle, and large numbers of cases of infection have arisen in laboratories as a result. The course of these cases is exactly like that of the disease contracted naturally, so to speak, but such infections never become centres for the spread of the disease to other persons in contact. Transmission from man to man does not in all probability occur.

The author summarizes at some length the published evidence regarding the part played by goats' milk in the epidemiology of undulant fever. Ingestion of contaminated milk cannot be incriminated in all cases, and a summary is given of articles published upon the transmission of the disease by other means. It is pointed out that cases have been recorded in which the individuals affected have come into close contact with animals by reason of their calling, and such cases have been observed, particularly in butchers. In these, inoculation suggests itself as the method of infection. For this reason the boiling of milk cannot be looked upon as an infallible means of preventing the disease among human beings.

Reference is made to the records of positive results having been obtained in agglutination tests in which mule serum has been used, and to the far less pronouncedly positive reactions obtained by some authors using horse serum.

The occurrence of the infection in sheep appears to be definitely established.

The serum of normal dogs may cause agglutination up to 1 : 600 according to VALLET & RIMBAUD, but KENNEDY has reported the isolation of the micrococcus from the mesenteric glands of a dog, one out of nine giving positive agglutinations. Similarly, SHAW obtained the organism from the mesenteric gland of a cat.

Rabbits and guinea-pigs appear to be capable of contracting the infection under natural conditions.

But there can be no doubt that in spite of these positive results the goat is the natural reservoir of the virus.

Two main lines of action are indicated for the control of the disease among goats. These are sanitary police regulations and immunization.

The *Micrococcus melitensis* does not, as a general rule, provoke the formation of any lesions in infected goats, but it appears to be a fact that complete recovery from infection is not known to occur. The organism is, according to experimental data, capable of maintaining its existence in the outer world under favourable conditions for periods amounting to weeks.

Since the urine is the principal source of contamination in the outer world, it appears to be improbable that any sanitary police regulations could be devised which would be effective for the control of the disease.

With regard to the recognition of the existence of the disease in herds of goats, it is pointed out that there is no constant symptom. Abortion has been noted on a number of occasions, but this is not invariable. It is, in fact, stated that in Malta, Tunis, and Algeria, where the disease is most widely spread, abortion seldom occurs, but the explanation of this possibly is that, as in the case of bovine abortion, this mishap usually occurs shortly after infection only. It is only when a large number of abortions occur in a herd or in a country that attention is called to its occurrence. Such accidents may be due, in reality, to *B. abortus*, but if that is so there is no criterion by which differentiation can be established.

Up to the present no method of vaccinating goats against melitococcus infection has been devised. It is not possible to apply the method used for contagious abortion of cattle. The process there is not, in reality, one of vaccination, but of infection. Animals inoculated with living culture continue to harbour the infection, although abortion does not occur.

The author suggests that it might be possible to protect goats against the micrococcus by inoculating them with Bang's bacillus. This harmless agent might possibly prevent the multiplication of the micrococcus, but it is also suggested that passage through the goat might exalt its virulence for man, and thus identify it with the micrococcus.

The author sums up his review by formulating the following prophylactic measures :—

All goats' milk should be boiled before it is drunk. That used for making cheese in infected areas should be pasteurized.

Herds of milking goats should be under sanitary surveillance in infected areas.

The importation of goats into France from countries known to be infected should be forbidden.

YAKIMOFF (W. L.). **La fièvre ondulante au Turkestan russe.** [Undulant Fever in Russian Turkestan.]—*Bull. Soc. Path. Exot.* 1923. Apr. 11. Vol. 16. No. 4. p. 227.

During 1913 the author tested the serum of six goats with a strain of *M. melitensis* received from Tunis. One of them gave a positive result to the agglutination test.

VALLÉE (H.). **Sur l'inoculation intra-cutanée de la Bactéridie charbonneuse.** [Intracutaneous Inoculation with the Anthrax Bacillus.] —*Rec. Méd. Vét.* 1923. July 30. Vol. 99. No. 14. pp. 285–288.

Having referred to BESREDKA's discovery regarding the insusceptibility of the guinea-pig to anthrax by inoculation in any way other than by the intracutaneous path, the author points to the necessity of ascertaining, if possible, whether this possibly applies to other animals and to other infections. The difficulty of infecting cattle by subcutaneous inoculation is well known.

Vallée had at his disposal five heifers, which had become unfit either for experimental work or for the butcher. These were inoculated intradermally in the caudal fold with 0·1 cc. of a 24-hours' broth culture of the anthrax bacillus just isolated. The following reactions were observed : From the 18th hour the folds showed soft, painless swellings without any indication of inflammation. At about the 24th hour the swelling increased, and became red and painful. At this stage it ranged in size from a plum to an apricot. Between the 36th and 48th hours the animals' temperatures rose to nearly 42° C., and remained high, while the lesions developed characters closely resembling those of malignant pustule in man. This continued for three or four days. In the case of three animals the symptoms gradually subsided and the animals recovered, but they had lost condition to a marked extent. The other two animals died of typical anthrax 48 and 65 hours after inoculation. When the minute dose used in these experiments is taken into consideration, as compared with the sometimes immense doses which have been used in earlier cases in order to obtain infection by the subcutaneous route, the only conclusion that can be arrived at is that the ox is as susceptible to intracutaneous inoculation as is the guinea-pig.

The history of experimental pathology is full of parallel cases : pleuropneumonia, rabies, sheep-pox, blackquarter, foot-and-mouth disease. In connexion with the last of these the author has frequently

found that large doses of virulent blood serum, which are non-pathogenic by the intravenous and subcutaneous paths, are infective by intradermal inoculation.

Similarly, certain bacterial products and toxins sometimes produce severe reactions when minimal does are injected intradermally, while the same doses injected in other ways are inactive (mallein, tuberculin, diphtheria toxin, etc.).

That guinea-pigs which have failed to become infected with anthrax when inoculated in some way other than by the intradermal path do not acquire any immunity is not a matter for surprise, since analogous observations have been made in connexion with pleuropneumonia and foot-and-mouth disease.

These facts have an important bearing upon the subject of vaccination. It is now a simple matter to vaccinate guinea-pigs against anthrax by intracutaneous inoculation. It was formerly held to be impossible to confer such protection.

Further investigation is essential. It must be ascertained whether the most favourable path for infection is also the most favourable for immunization.

DOYLE (T. M.). **The Value of Attenuated Cultures for the Immunisation of Bovines against Haemorrhagic Septicaemia.**—*Jl. Comp. Path. & Therap.* 1923. June. Vol. 36. No. 2. pp. 109–118.

The author has carried out experiments upon lines suggested by the paper by D'HERELLE and LE LOUET in the *Annales de l'Institut Pasteur* for November 1921 [see this *Bulletin*, Vol. 10, No. 2, May, 1922, p. 42]. These authors found that passage of the organism through a series of rabbits, followed by cultivation in a broth made from rabbit meat produced a safe and reliable vaccine.

Doyle's strain was obtained from Muktesar, where it has been repeatedly passed through rabbits, and he therefore did not think it necessary to pass it through rabbits again before sowing it out in rabbit broth.

As Cyprus cattle are employed for the serum production in Egypt, and as these are costly, it was decided in the first instance to use the rabbit broth cultures on animals already immunized by double inoculation, that is to say, to use it for the first hyperimmunization dose.

Three animals were used. One died and one had a severe reaction. It appeared that the virulence of the organism had become exalted in the rabbit broth. The author does not refer to any tests in which the virulence of the culture was ascertained prior to the cultivation in rabbit broth.

In the next experiment the culture was first passed in series through eight rabbits. Cultures were made in rabbit broth from the last of these and incubated for 15 days at 37° C.

A dose of 0·5 cc. proved fatal to a Cyprus bull in 84 hours.

Experiments were carried out with the object of ascertaining the effects of incubation for varying periods, and of comparing the virulence of cultures in beef and rabbit broth.

Guinea-pigs were used, and the seed material was from the eighth rabbit of the series previously referred to.

The beef and rabbit broth flasks were divided into two lots. One batch was capped with rubber caps and the other left uncapped.

It was found that in every case the cultures in the capped flasks retained their virulence for periods up to 28 days, but that the cultures in rabbit broth were more rapidly fatal than those in beef broth.

The virulence of the cultures in the uncapped flasks rapidly declined, for after 14 days' incubation they failed to produce a fatal result, but conferred immunity.

The author reviews some of the literature referring to this disease, and considering the results obtained in comparison with his own, concludes that the virulence of the bacillus of haemorrhagic septicaemia varies greatly in different places.

TEPPAZ (L.). **La tuberculose bovine à l'abattoir de Dakar. (2e Note.)** [Bovine Tuberculosis at the Dakar Abattoir.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 381–383.

The case here described is the fourth case of tuberculosis found in an animal slaughtered at Dakar. The animal was a zebu, 12 years old. The lungs were filled with lesions ranging in size from a millet seed to a nut. All the thoracic glands were involved, but the pleura and abdominal organs appeared to be free from lesions.

A guinea-pig and a rabbit were inoculated subcutaneously with a thick suspension from one of the tubercles.

The guinea-pig died on the 26th day. The lesions were as follows: An ulcer at the seat of inoculation, two caseous sublumbar glands, and about a dozen small abscesses in the liver. All the internal organs were congested. The guinea-pig is said to have died from acute septicaemic tuberculosis.

The rabbit showed neither local nor general symptoms of infection at the end of the fourth week, and is therefore considered to have failed to become infected. It does not appear to have been killed and examined post-mortem.

These results are contradictory as compared with those previously obtained, and upon the available facts it is difficult to form an opinion as to the type of bacillus found in the zebus.

VAN SACEGHEM (René). **Pleuropneumonie des Bovidés, due à un nouveau bacille.** [Bovine Pleuropneumonia due to a New Bacillus.]—*Bull. Agric. Congo Belge.* 1923. June–Sept. Vol. 14. Nos. 2–3. pp. 396–399.

The author claims to have discovered the causal organism of a type of pleuropneumonia in cattle which has not been described hitherto. The disease which occurs in peracute, subacute, and chronic forms attacks cattle only under natural conditions, but is transmissible to the sheep, goat, and rabbit experimentally. The pig and dog are resistant. It is said to occur enzootically, and sometimes as an epizootic in Ruanda. In the peracute form there is high fever, disturbance of respiration, in some cases abundant salivation, lachrymation and swelling of the eyelids. Death takes place in a few days. At the post-mortem there may be found single, double, or only localized pleurisy. There is an amber-coloured sero-fibrinous exudate. The pneumonic lobes vary in colour, and the interlobular septa are thickened, producing a mosaic-like appearance.

In the subacute cases the lesions are less extensive, and there may be found only a number of fibrous tubercles about the size of filbert

nuts, which have a centre composed of brownish pulp-like material. There is sometimes cirrhosis of the liver.

The causal organism is discoverable in the lung lesions and in the blood in fatal cases. It is a very small gram-negative cocco-bacillus. It grows poorly on plain agar, but well on agar to which gum arabic has been added in the proportion of 10 grammes for every 500 grammes of meat used. A more exact statement cannot be made, as the amount of water used in making the agar is not given. The bacillus does not liquefy gelatin, nor coagulate milk. Litmus is not turned red. Liebig broth is at first rendered turbid, but later clears up. On potato a thin layer of growth develops.

Intravenous inoculation of a calf, goat and sheep with a culture, resulted in death in each case. The calf and goat died within 12 hours and the sheep after three days. At the post-mortem pneumonia and pleurisy with effusion were found. The bacillus was recovered from the blood. Cultures are fatal to rabbits in 12 hours.

Young cattle appear to be more susceptible than adults to experimental infection, but this may be due to acquired immunity. This type of pleuropneumonia appears to be a frequent complication of rinderpest, and the author has observed several cases of the disease following transfusions of blood in the course of the preparation of antirinderpest serum.

FUTAMURA (H.). **Studies on Bovine Influenza (Second Report).**—*Jl. Japan Soc. Vet. Sci.* 1923. June. Vol. 2. No. 2. [Author's English Abstract. pp. 200–202.]

The author describes an outbreak of the disease known as bovine influenza among the cows and calves in a dairy herd. Twenty-three cows and 14 calves were attacked within a month. Treatment, including the use of hyperimmune serum, was resorted to, and all the cows recovered. The disease continued to spread among the calves until 22 had become infected. Of these 13 died.

Post-mortem examinations were made of seven chronic cases and one acute one.

In the chronic cases hepatization of the lungs with multiple abscess formation was constant. The intestines showed pronounced congestion, and the liver and kidneys were enlarged.

In the acute case the lesions were haemorrhagic enteritis, subcutaneous oedema, enlargement of the liver, spleen, and kidneys, and oedema of the lungs.

Bipolar bacilli were obtained in some cases in pure culture from infected organs, and in other cases from mice experimentally infected with emulsions of them.

The author does not make it quite clear to what extent serum was used in the treatment of these cases. At the beginning of the abstract it is said that ordinary treatment, combined with serum, was not effective in the case of calves, and one is led to think that all the diseased calves were treated. Subsequently it is stated that only 11 calves were treated with serum and that all recovered. This is qualified by the statement that three had relapses and died. The dose of serum used was 50 cc., and this was repeated two or three times.

The author draws attention to the resemblance of this disease to the pleuropneumonia of calves in other countries.

TRAUM (J.). **Lymphangitis in Cattle caused by an Acid-fast Organism.** —*Cornell Vet.* 1923. July. Vol. 13. No. 3. pp. 240–245.

In this paper the author continues his observations regarding cases of lymphangitis in cattle caused by an acid-alcohol fast organism. He has previously placed on record 12 such cases, 6 in 1916 and 6 in 1919 [see this *Bulletin*, 1919, Dec., Vol. 7, No. 4, p. 285, ref. only].

The lesions of the disease are subcutaneous nodules ranging in size from a bean to a goose egg along the course of lymphatic vessels, usually on a limb, but occasionally elsewhere. In some cases a number of the nodules form a large cluster. The nodules vary in density to the touch, but on section are always found to have necrotic centres which are generally becoming liquid.

In a few cases the organisms were plentiful, but are usually scarce. They ranged from 2–3·5 μ in length, were straight or curved, and presented a beaded appearance in some cases. Occasionally smears showed a scattering of organisms which had taken the counterstain.

Large numbers of guinea-pigs, rabbits, some chickens, mice, calves and swine developed no lesions of diagnostic value after inoculation. In occasional cases rabbits and guinea-pigs developed local lesions at the seat of inoculation, but these disappeared within three weeks. Acid-fast bacilli were sometimes found in these. It is estimated that not less than 50 per cent. of cattle showing these lesions would react to tuberculin (estimate based on a small number of cases). About 25 animals showing the subcutaneous nodules have been examined post-mortem, but in no case has the simultaneous existence of tuberculosis been detected.

The author states that all kinds of media were used in attempting to cultivate the organism, but in most cases they remained sterile. In one tube of cooked blood agar a growth was obtained, but since this on subculture grew readily on a number of ordinary media, it appears doubtful whether it was the causal organism of the lesions.

Guinea-pigs, rabbits and calves inoculated with it developed local purulent lesions, but acid-fast bacilli were not discoverable in the pus.

TRAUM (J.). **Lymphangitis of Cattle caused by the Preisz-Nocard Bacillus.**—*Cornell Vet.* 1923. July. Vol. 13. No. 3. pp. 246–249.

The author reports two cases of lymphangitis in cattle from which he was able to isolate typical Preisz-Nocard bacilli. His findings are in agreement with those of other investigators.

MAZZUCHI (M.). **Contributo allo Studio dell' azione patogena del bacillo del carbonchio ematico.** [The Pathogenic Effects of the *Bacillus anthracis*.]—*Clinica Veterinaria.* 1923. July–Aug. Vol. 46. No. 7–8. pp. 421–435.

DISEASES DUE TO FILTERABLE VIRUSES.

ONO (S.) & KONDO (S.). **Studies on Rinderpest in the Deer** (*Cervus sika*) **and Changes in the Blood of Infected Animals.**—*Jl. Japan. Soc. Vet. Sci.* 1923. June. Vol. 2. No. 2. [Authors' English Summary, pp. 158–161.]

Cervus sika is susceptible to rinderpest. The period of incubation in cases of natural infection does not exceed 10 days, and after experimental infection it is 3–6 days. Serum was found to be curative when administered at the onset of fever, and repeated four days later. For this purpose doses of 50 cc. were used.

The virus disappears from the circulation within six days of recovery. The plasma became progressively more yellow in colour as the temperature rose, owing to the presence of bile in it. The percentage of haemoglobin decreased, but the red corpuscles became less fragile when tested with salt solution. There was a simultaneous decrease in the number of red corpuscles, but this tended to rise again towards the end.

Leucocytes increased in numbers between infection and the rise of temperature. The number fell during the febrile period, but increased as the temperature fell.

VAN SACEGHEM (R.). **La peau, voie de penetration pour le virus de la peste bovine.** [The Skin as a Port of Entry for the Virus of Rinderpest.]—*Bull. Agric. Congo Belge.* 1923. Mar. Vol. 14. No. 1. pp. 56–57.

In some earlier experiments, in which the author attempted to infect animals with rinderpest by rubbing defibrinated virulent blood into scarifications on the skin, only negative results were obtained. It occurred to him that this might be due to the destructive action of the sun upon the virus.

An animal was scarified lightly on the thigh, and an emulsion of buccal crusts ground up in salt solution was applied. The animal was kept indoors throughout the experiment. Infection resulted, the temperature rising on the third day. Death occurred on the tenth day.

The scarifications showed a local lesion resembling those found on the gums in naturally infected cases.

VAN SACEGHEM (R.). **Essais de vaccination contre la peste bovine avec du sang pesteux chauffé.** [Vaccinations against Rinderpest with Heated Virus.]—*Bull. Agric. Congo Belge.* 1923. Mar. Vol. 14. No. 1. pp. 47–49.

The author gives the results of injecting 1 cc. of rinderpest blood, heated in two cases to 55° C. for 15 minutes, in two to 58°–60° for 30 minutes, and in two cases 1 and 5 cc. of blood heated to 60° C. for an hour. Three out of the first four died. One showed a rise of temperature and recovered. The two which were inoculated with the blood heated for an hour at 60° C. failed to become infected.

BALOZET. **Etude clinique et expérimentale de l'anémie infectieuse des Equidés au Maroc.** [Clinical and Experimental Investigation of Pernicious Anaemia of Equines in Morocco.]—*Bull. Soc. Path. Exot.* 1923. July 11. Vol. 16. No. 7. pp. 525–533.

In 1921 the author, in collaboration with VELU, published an account of an equine disease observed in Morocco, the nature of which they were

not able to state with certainty. The investigations undertaken subsequently enable Balozet to state that the disease is identical with the typhoanaemia of CARRÉ and VALLÉE and with the so-called swamp fever of American and other authors.

The disease occurs naturally in the horse, ass and mule. It has a seasonal distribution, and is characterized by febrile attacks at irregular intervals. The temperature curves are picturesquely described as being "steeple-like." Petechiae on the visible mucous membranes is a marked symptom in the horse. These are seldom or never observed in the ass and mule. Cases occur during the period May–October.

Young animals are susceptible to infection, the author having seen a case in a foal three months old.

The disease invariably runs a chronic course, although in the early stages there may be very severe temperature reactions. After this first period affected animals become dull and listless, and lose considerably in condition. The temperature is irregular. There may be elevations which persist for a day or two, and at other times there may be a difference of three degrees between the morning and evening temperature for several days on end. This phase may last for a long time.

It has been observed on a number of occasions by army veterinary officers that the disease attacks horses in the irregular forces with far greater frequency than those belonging to the regular army. Better management and feeding have been held to account for this. It has also been suggested that, as there is a probability that the disease is insect transmitted, the regular army horses are less exposed to the bites of flies than are those of the auxiliaries, since the latter turn their horses loose to graze far more commonly.

Mere contact does not lead to transmission of the disease. This has been proved by experiment on a number of occasions, and when a number of cases occur in a unit these are never (or save only by chance) animals standing next to each other.

The mortality is low, but on service it may be higher on account of overwork.

Details of experiments are given, and these furnish evidence that in the first place the disease is transmissible by inoculation with whole blood, and secondly that filtration does not hold back the virus. Contrary to what the Japanese, German, and South African investigators found, the author was not able to transmit the infection to pigs. But only a single experiment was carried out, and it is noted that it should be repeated.

According to BASSET, a definite diagnosis can be based upon the production of a rise of temperature at will by the intravenous injection of 100 cc. of normal horse serum, or a subcutaneous injection of a concentrated solution of sodium chloride or potassium iodide. The explanation of this action is that the blood is in a condition of unstable equilibrium which is readily disturbed by these means. The author has carried out experiments upon these lines, but has failed to provoke a reaction.

Blood counts have shown that there is a direct relationship between the severity of the disease and the number of red corpuscles, and it would appear that the number of corpuscles drops after a febrile attack. The leucocyte count varies within normal limits. But there is a marked proportional increase in the number of polynuclears during the crises.

Auto-agglutination of the corpuscles has been observed.

The paper contains an extensive bibliography.

BIGOT. **L'anémie pernicieuse du cheval au Maroc. Persistance du virus chez les animaux guéris.** [Equine Pernicious Anaemia in Morocco. Persistence of the Virus in Recovered Animals.]—*Bull. Soc. Path. Exot.* 1923. May 9. Vol. 16. No. 5. pp. 300–303. With 2 figs.

Blood was taken from two animals which had made apparently complete recoveries from natural infections some months before, and injected in doses of 200 cc. into two fresh animals. Both showed an elevation of temperature on the day of inoculation, and subsequently, on the 17th and 23rd days respectively, showed sudden elevations of temperature to 40° C. and 41° C. Apart from this and a very faint yellowish tinge of the mucous membranes, which would have escaped observation unless very carefully looked for, the animals showed no disturbance of health.

It was therefore found that recovered animals harbour the virus long after apparent recovery. The following facts also emerged from the experiment.

The period of incubation is longer than when blood from animals actually ill is used for inoculation. These were 17 and 23 days, as compared with 9–16 days. Infection in the cases recorded here would have escaped detection but for the daily use of the thermometer. The blood of recovered animals, therefore, produces a milder infection.

It is proposed to test these animals later with blood from an animal actually affected with pernicious anaemia.

NAGAO (M.). **Über die Widerstandsfähigkeit des Virus der infektiösen Blutarmut des Pferdes und der Rekurrensspirochäten gegen die Kälte.** [The Resistance of the Virus of Equine Infectious Anaemia and of the Spirochaete of Relapsing Fever to Cold.]—*Jl. Japan. Soc. Vet. Sci.* 1923. June. Vol. 2. No. 2. pp. 127–131.

The author mixed the virulent blood from a case of equine infectious anaemia with 0·9 per cent. salt solution containing 1·5 per cent. sodium citrate in the proportion of 3 to 1. This was kept in an ice-chest at 0° to 2° C.

It was tested after six months, one year, and two years. It is said that the virus was found to be virulent after two years, but that this was so does not appear to be clear from the test. A positive result was obtained with one of two horses inoculated with virus which had been kept for a year.

Spirochaeta duttoni was found to retain its virulence up to 105 days in an ice-chest, but only up to seven days in an incubator at 37° C. The parasite was kept in citrated blood.

FRÖHNER (E.) & BIERBAUM (K.). **Ueber Resistenz des Virus der ansteckenden Anaemie der Pferde gegen Karbolsäure.** [The Resistance of the Virus of Equine Contagious Anaemia to Carbolic Acid.]—*Berlin. Tierärzt. Woch.* 1923. May 31. Vol. 39. No. 22. pp. 243–245.

The importance of this question lies in the possibility of the virus occurring in protective sera derived from horses for use in equine diseases. A second point is that according to Japanese investigators the pig is susceptible to the infection, and this might also lead to a dissemination of the virus in protective sera prepared from swine.

A small number of tests have been carried out with a view to testing the resistance of the virus to carbolic acid. Expense prevented the question from being dealt with in a comprehensive manner. The authors have therefore had to content themselves with ascertaining the period required for a definite concentration of carbolic acid to prove fatal to the virus. The results of the experiments showed that it required a period of three months to ensure the destruction of the virus in serum by means of carbolic acid in a concentration of 0·5 per cent.

OHAHI (M.). **On the Changes in the Blood and the Distribution of the Virus in Rabid Animals.**—*Jl. Japan Soc. Vet. Sci.* 1923. June. Vol. 2. No. 2. pp. 203–209.

The author has examined the blood of rabbits and dogs inoculated with the fixed virus of rabies.

In a tabular statement the counts of the total number of leucocytes present in the blood of 14 rabbits before and after infection are given. The period of incubation is given as four to five days, and the course of the disease 2–4 days.

In most cases it is seen that the number decreased between inoculation and the appearance of symptoms, but that subsequently there was a more or less steady increase. In about 30 per cent. of animals there was a decrease just before death.

The figures given for the leucocyte counts of two dogs show that similar changes were observed in these.

The author also gives tabular statements of the differential counts of leucocytes in rabbits (average for 14) and in dogs (average for four).

The lymphocytes showed the most pronounced reduction, and the "Pseudoeosinophile" leucocytes the most marked increase in the case of the rabbits.

In the dogs the lymphocytes showed a marked decrease and the neutrophiles a marked increase. In the dogs the eosinophiles disappeared entirely by the fourth day after injection.

In a table the author gives his findings with regard to the distribution of the virus in the body.

The virus was present constantly in the "nervous plexus," brain and spinal cord. The submaxillary gland is shown in the table as being positive in eight cases out of ten, and the aqueous humour in six out of seven. In the summary it is said that both of these always contain the virus.

The virus has not been found in the blood, spleen, kidneys, lungs, muscles and bone marrow. It has been found occasionally in the liver (1 case in 10), pancreas (1 in 10), adrenals (2 in 10), and lymphatic gland (1 in 7).

SACHELARIE (V.). **Quelques remarques sur le traitement antirabique chez les bovidés.** [The Antirabic Treatment of Bovines.]—*Archiva Veterinara.* 1923. Vol. 17. No. 1. pp. 1–3.

By antirabic treatment the author means active immunization by intravenous injections of material from the nervous system of a dog infected with street rabies after an animal has been bitten. The matter is one of importance in view of the frequent occurrence of rabies and of the value of cattle, whether for meat or milk production.

Cattle are particularly exposed to the bites of rabid dogs because dogs are so frequently used for protection on farms, and the bites are

the more dangerous from the point of view of rabies because, owing to the habit of lowering the head, cattle are almost invariably bitten about the head or neck.

After referring briefly to the methods and results of some other investigators, the author describes the technique employed by him. Four grammes of grey matter from the brain of a dog recently dead of rabies are emulsified in 20 cc. of salt solution and strained through muslin. This dose is injected into the jugular vein on two successive days, and great care must be exercised to ensure that the dose actually enters the blood-stream, and that none escapes into the perivascular tissues.

Since 1919 17 cattle have been treated in this way without accident. In most cases the injections have been given between the second and fourth days after the bite. One case is referred to in which the injections were made ten days after the animal was bitten. In this case the cow became rabid after a lapse of seven weeks.

It is stated that lactating animals may be injected intravenously with street virus without it being necessary to take the calves off them. Pregnant animals may be inoculated with safety, and healthy calves are produced, even though the cows may become rabid later through delay in administering the inoculations.

KULKARNI (T. N.). **A Case of Rabies in a Goat.**—*Vet. Jl.* 1923. July. Vol. 79. No. 7. pp. 245–246.

A five-year-old she-goat was observed by its owner to be attacking all persons and animals approaching her. She was very restless and bleated at short intervals. When tied up she butted the wall at short intervals and bit pieces of cement from it. The approach of another animal aggravated the symptoms. Frequent arching of the back was observed. Careful examination failed to reveal any evidence of the bite of another animal. While under observation the goat was seen to bite its own thigh. The following days the symptoms were more marked. The eyes were prominent, there was complete loss of appetite, and pronounced restlessness. Death occurred the next day.

The rumen and reticulum contained sand, earth, and some hair. The third and fourth stomachs and the intestines were empty.

Negri bodies were found in the brain.

MYCOTIC DISEASES.

DEKESTER (M.) & JEAUME (G.). **Cas multiples d'une Blastomycose des voies lacrymales observée chez les ânes dans la région de Fez (Maroc).** [Cases of Blastomycosis of the Lachrymal Ducts in Donkeys in Fez.]—*Bull. Soc. Path. Exot.* 1923. July 11.. Vol. 16. No. 7. pp. 478–480.

The disease described in this paper has been seen in donkeys only, never in horses or mules. The first cases came under observation two years ago, and all came from Fez and the surrounding districts.

The disease is most frequently seen in animals up to four years old, and it makes its appearance at the beginning of the hot season. It appears to be far from rare, since 27 cases have come under observation within two months.

As a rule only one eye is involved, but both may be affected simultaneously or consecutively. The first symptom is an amber-coloured nasal discharge, and this is followed by a slight conjunctivitis with a semi-purulent greenish discharge.

Subsequently a bud-like swelling is seen projecting from the orifice of the lachrymal duct. The swelling is pink in colour and bleeds very easily. The tumours may attain a considerable size. In one case a tumour was removed which weighed 8 grammes.

Surgical removal is followed by a recurrence in three to four weeks. General health does not appear to be impaired, nor is there any enlargement or suppuration of the glands.

On section the growths are found to be composed of connective tissue which is richly supplied with capillaries, epithelioid cells and large numbers of giant cells. Under a high magnification there are found throughout the specimen, within giant cells and between them, little granules which stain with haematin with a border faintly stained with eosin. They appear to be grouped in batches of five or six, and measure about 3 microns. Similar bodies are to be found in the purulent nasal and conjunctival secretions. They appear to multiply by budding. At places 8 or 10 of these bodies may be found surrounded by a thin capsule. In the same section one may also find groups of refractile corpuscles, each measuring 0·5 μ, and surrounded by a thin envelope.

Culture experiments have so far yielded negative results.

MISCELLANEOUS.

ANDREWS (W. H.). **Snake-Bite.**— *Union of S. Africa Jl. Dept. Agric.* 1923. July. Vol. 7. No. 1. pp. 47–59.

The author draws attention to the importance of snake-bite because of the possibility of mistakes being made in diagnosis. Any swelling developing suddenly is usually ascribed to this cause, and there is a danger that diseases such as anthrax may be wrongly diagnosed.

In the author's opinion the actual losses of animals from snake-bite are not very large.

The liability of an animal to snake-bite depends upon the conditions under which it is kept. Dogs, and particularly sporting dogs, are the most frequently attacked. Cattle are more frequently bitten than horses, and sheep are not rarely attacked. Cats are not bitten to the same extent as dogs, although they hunt and kill snakes; it is their caution and rapidity of movement which save them. There is no reason to think that they possess any degree of immunity.

The pig, while certainly not immune, possesses a higher degree of resistance than other animals. Pigs readily devour snakes, and it is reported that they are used in the Mississippi Valley for clearing low-lying land of rattle-snakes. The pig owes its apparent immunity to the nature of its skin and to the underlying fat. Venom is only capable of exerting its action if it reaches the blood-stream, or is brought into direct contact with nerve tissues.

In dealing with the classification of snakes, the author dwells upon the necessity of very close observation for the recognition of venomous

from non-venomous species. He divides the snakes of South Africa into three main groups: non-venomous, semi-venomous, and venomous. A diagram shows the means by which these three groups may be distinguished. The only character which need be examined is the arrangement of the teeth in the upper jaw. In the non-venomous snakes there are two long rows of teeth on each side of the upper jaw. There may be 30–40 in the outer row and 20 or more in the inner. These teeth vary in size in different species, and the distribution of the large and small teeth is not constant, but when carefully examined they are found to be all solid. None of them shows any sign of a groove.

In the very venomous snakes the fangs are well forward in the mouth, and one or two may be found on either side. There may be a few small teeth behind the fangs, but in many species the outer row is quite absent save for the fangs. The membrane lining the mouth is folded in such a way that it forms a sheath for the fangs, so that when the mouth is open the fangs may not be disclosed. The fangs have either a canal running through the centre or a groove along their length which communicates with the venom gland, which lies under the skin and muscle below and somewhat behind the eye. The adders or vipers are distinguished by the flexibility of the front part of the upper jaw The semi-venomous snakes are less easy to distinguish than the venomous, because of the existence of two rows of teeth on each side, but at the hinder part of the outer row there are several grooved fangs. In the smaller species a magnifying glass is necessary for the recognition of these.

The symptoms produced vary with the type of snake inflicting the bite, and with the amount of venom injected.

In the case of the colubrine snakes—cobras, mambas, etc.—the venom acts chiefly upon the nervous system, the venom being conveyed by the blood-stream. In the case of the adders and vipers the principal effects are seen in the tissues round the bite and in the walls of the blood-vessels. But this division is by no means an absolute one.

The symptoms following the bite of a cobra are, broadly speaking, as follows :—

The animal shows a period of excitement, the duration of which varies from a few minutes to hours. Then follows a very variable period during which the animal may appear to be perfectly normal. In most cases this period of quiet is followed by a second phase of excitement. Convulsive muscular contractions appear, and death takes place as a result of cessation of respiration. The heart may continue to beat for some minutes after the cessation of respiration.

If death does not occur from asphyxia, sooner or later a period of general depression sets in, which may be broken by periods of excitement, or may be continuous and terminate in death or gradual recovery.

In the case of adder-bite the symptoms follow much the same sequence, but present the following differences: the symptoms of pain are far more pronounced, the local swelling is much larger, early death from asphyxia is less common, and symptoms of inco-ordination and paralysis are not, as a rule, observed.

The question of the location of the swelling is of importance in connexion with treatment, since the liquids which accumulate under the skin and are responsible for it tend to gravitate.

Treatment may be summarized as follows: It must be started at once. If possible, apply a tight ligature on the proximal side of the bite, and immediately this has been done make cross-cuts over the site

of each puncture, and be certain that these are sufficiently deep. Encourage bleeding—squeezing the affected part. Rub powdered permanganate of potash well into the cuts, and a little strong solution may be injected into the tissues around the bite. Cover the wound with a compress soaked in strong permanganate solution. Calcium hypochlorite solution may be used in place of the permanganate. Stimulants, such as alcohol or coffee, should be given and rugs applied.

RABAGLIATI (D. S.). **Poly-Arthritis in Camels.**—*Jl. Comp. Path. & Therap.* 1923. June. Vol. 36. No. 2. pp. 90–96. With 3 text figs.

The condition described has been observed only in small inferior camels from Somaliland. It was never seen among the thousands of Egyptian, Sudanese, Arabian, Tunisian, Moroccan, Algerian and Indian camels used during the war.

The disease is characterized clinically by stiffness, lameness, and inability to kneel down readily; and these symptoms are due to ulceration of the articular cartilages of certain joints associated with thickening of the synovial membranes, and in some cases rarefying ostitis.

Camels of all ages are apparently attacked. The disease was noticed soon after the animals arrived in Egypt from Somaliland, and some of those affected showed signs of having been fired for it prior to purchase.

There was no evidence that the condition was a specific one, and attempts to transmit it by inoculation failed.

The lameness was more marked when an animal was first moved, and resting appeared to aggravate it.

Treatment was of no avail, and affected camels were usually fattened for beef.

Bacteriological investigations carried out by MASON yielded negative results.

The ulcerative process appeared to begin in the deeper layers of the cartilage, or at the junction of the cartilage and the bone. The ulcerations varied in size and outline, and in the earlier active stages showed haemorrhagic raised edges. Ulcerations on opposed articular surfaces were not always opposite to each other. The affected joints were never swollen, there was no marked excess of synovial fluid, although the fluid present was sometimes turbid, and pus was never found in the joints.

ADLER (S.) & CLARK (E. J.). **A Case of Acute Ascending Paralysis in a Chimpanzee.**—*Ann. Trop. Med. & Parasit.* 1923. July 12. Vol. 17. No. 2. pp. 299–301.

The chimpanzee (*Anthropopithecus troglodytes*) was captured apparently unharmed, and was chloroformed for the purpose of caging. Recovery from the anaesthetic was rapid. On arrival at Freetown two days later the animal appeared to be in perfect health and condition save for two abrasions on the loins, caused by the chafing of a rope. A week later the animal refused its food, and on examination was found to be completely paralysed in the lower limbs. The paralysis extended rapidly, and two days later the trunk and upper limbs were paralysed; there was cyanosis of the face and dyspnoea.

An intramuscular injection of novarsenobillon (0·09 gm.) appeared to effect some improvement, although the animal could not swallow solid

food. After an interval of a day the injection was repeated. Four days later fibrillar twitchings were observed in all the muscles and death occurred. At the post-mortem examination slight turbidity of the cerebrospinal liquid and congestion of the surface of the brain and cord were observed.

Microscopically the most pronounced change was vacuolization and varying degrees of degeneration of the nerve cells in the anterior and posterior horns, Clarke's column, medulla and cord.

Experimental inoculations and other circumstances (contact, etc.) indicated that the animal was not affected with acute anterior polyomyelitis.

STIRLING (R. F.). **Seasonal or Non-Contagious Diarrhoea of Cattle in the Central Provinces, India.**—*Vet. Jl.* 1923. July. Vol. 79. No. 7. pp. 239–242.

The disease is observed during June and July, that is, at the beginning of the monsoon. It leads to great loss of condition and, in consequence, inability to work in bullocks, and decreased, or even complete, suppression of the milk in cows. The condition is not a febrile one, the temperature falling in severe cases.

The faeces become very fluid, and are of a bright green colour. They are passed at intervals of about 20 minutes without any evidence of pain or straining. Rumination is suspended and great thirst is evinced.

Nothing is known regarding the cause of the condition. Enquiries were made in the districts, but there was practically no agreement as to which plants are held to be responsible for it. One plant, however, *Cassia tora* (a legume), was reported as a cause from four districts. No information as to any poisonous property of this plant could be obtained. Prognosis is favourable.

Treatment was instituted, and doses of 20 grains of potassium permanganate were given in two pints of water every half-hour until a total of 2 drams of the permanganate had been given ; 285 animals were treated, and all recovered but two. One of these died shortly after admission to the hospital, and the other had not completely recovered from rinderpest. Only 65 of the whole number were under direct observation in hospital. In 11 cases purging ceased after a single dose of the medicine, and in no case were more than six doses given.

THOMSON (J. G.). **The Common Occurrence of Pseudospirochaetes in the Blood of Blackwater Fever Cases, and of Normal Human Beings and Animals when using the Technique of Blanchard and Lefrou.**—*Jl. Trop. Med & Hyg.* 1923. Aug. 1. Vol. 26. No. 15. pp. 251–253.

The author refers to the cases in which spirochaete-like structures have been detected in the blood of blackwater patients, and discusses briefly the probable nature of these.

The technique employed by BLANCHARD and LEFROU was that used by MARTIN, LEBOEUF and ROUBAUD for the detection of trypanosomes. The essence of the method is that citrated blood is centrifuged, the plasma is drawn off and again centrifuged, the process being repeated

a third time. Thomson has used this technique in 15 cases of blackwater fever, and has seen the spirochaete-like structures described by BLANCHARD and LEFROU. To quote his own words :—

" In every case the centrifuged deposit of the third tube contained numerous pseudospirochaetes of two types, namely, thick motile filaments from 5 microns to 9 microns in length, and longer extremely fine filaments very actively motile measuring from 7 microns to 12 microns in length. These filaments correspond in every feature to those seen in clotted blood from normal individuals. These objects have no spiral movement, but appear to be actively motile, wriggling and bending on themselves. They are in reality more or less straight filaments without coils or spirals, but occasionally they have a beaded appearance suggesting a chain of streptococci. When fixed and stained they are often thrown into coils as a result of smearing and drying, thus simulating true spirochaetes, but differing from such in that they do not stain so intensely nor so regularly."

The author obtained the same results with a specimen of horse-sickness blood, and with practically all specimens of human blood from apparently healthy people.

He has not been able to obtain any confirmation of BLANCHARD and LEFROU's results following the inoculation of guinea-pigs.

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